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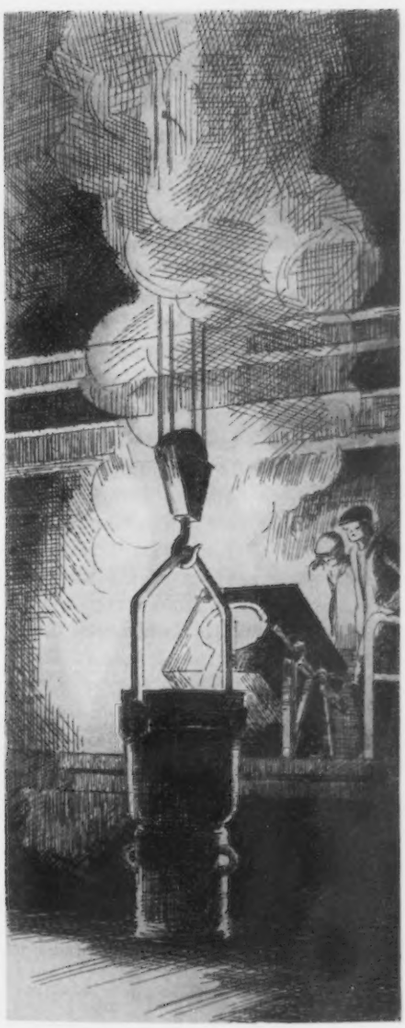
ONWARD MARCH OF HEAT TREATING IS IMPRESSIVE

By
EDWIN F. CONE



IN the 12 years since the founding of the American Society for Steel Treating in Chicago in 1919, the art of heat treating has become essential to many lines of the metal working industries. There are few important iron and steel products whose properties and uses have not been enhanced by heat treatment. In fact developments have been so many that it is with difficulty that one can keep in touch with them.

Gray iron, which only a few years ago had never been heat treated, has been improved by thermal treatment. Steel castings, particularly alloy, are today quenched and drawn to their great benefit. Malleableizing has been radically shortened. Tool steels have been multiplied in composition because they can be successfully heat treated. The large increase in classes of standard alloy steels has been made possible by heat-treating equipment and processes. Some examples are the chrome and chrome-nickel rust and heat-resisting steels, the structural alloy steels, the automobile and aircraft steels, such as chrome-vanadium and chrome-molybdenum, the carburizing nickel and other steels, and so on. Even the light aluminum and magnesium alloys are now subjected to heat treatment and welding has introduced new problems.

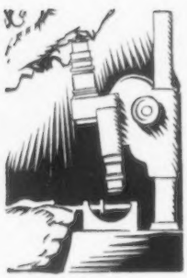
With the coming of heat-treating furnaces and incidental equipment, of complex alloy steels, of new heat-treating processes, new paths have had to be trod. Fatigue testing and magnetic analysis also have become associated with heat treating. Nitriding has revolutionized the case hardening of steel and its uses.

A few of these problems and developments are discussed in the articles which follow in this, THE IRON AGE's annual steel treaters' issue, brought out to signalize the National Metal Congress, which holds forth in Boston the week of Sept. 21.

"Crackless plasticity," a property of metals which is neither strength nor ductility and which is almost absent from heat-treated alloy steels; magnetic analysis, being used to check certain heat-treating results; the control of atmospheres in heat-treating furnaces; magnitude of electric heat-treating operations in the Ford plant; high copper alloy steels; heat treatment in making gears; these are some of the questions discussed. An article on a phase of nitriding will be used in a later issue.

CRACKLESS PLAS

FIG. 1.—SLIP LINES SHOWING PLANES ALONG WHICH CRYSTALLINE GRAINS OF PURE IRON HAVE YIELDED UNDER STRESS:—Note that these slip lines have different directions in different crystalline grains. Magnification 312 diameters. Micrograph made by Tibor Ver in the metallographic laboratories of the University of Illinois.



DEVELOPMENTS of recent years in the testing of steel to determine its resistance to distortion or fracture have shown that such resistance is by no means a simple property of steel and that no one test can be used as a basis of the prediction of the strength of steel in service.

For many years it was felt that the "true" elastic limit was an index of the strength of steel below which no failure would occur under any condition of service. The metallographic microscope and later the tests of the strength of single crystals of metal have rather thoroughly discredited this idea.[1] This idea of a perfect elastic limit rested on the assumption that a solid was uniform and indefinitely divisible without change of property. The microscope and the X-ray spectograph have shown us that this is not true and that each crystal of a metal has certain planes of weakness. Fig. 1 illustrates this point.

With the development of "fatigue" testing under repeated stress it was thought that the "endurance limit"[2] might prove the criterion for the strength of steel to be used in machine parts. However, it is becoming increasingly apparent that the endurance limit of steel as it comes from the steel maker may be either raised or lowered by the service to which a piece of metal is subjected. Millions of cycles of low stress raise the endurance limit of most metals appreciably. While a piece of metal may withstand without fracture thousands of cycles of stress well above the endurance limit, nevertheless such a period of repeated overstress not infrequently starts *cracks* in the metal which greatly reduce its ability to withstand further cycles of ordinary working stress.[3]

Tests at the University of Illinois have shown that if a crack one-tenth of an inch long is developed in a specimen of axle steel, the endurance limit of that steel is reduced to somewhere between 50 and 65 per cents of its original value.[4] In this connection it must be remembered that nearly all *maximum* stresses in machine parts occur at some surface of the part and that no surface of a metal is free from irregularities and, quite possibly, minute cracks invisible even under the microscope.

Crackless Plasticity Defined

It seems evident that an important property of steel is its *ability to stand occasional overstress without the development of a crack which, in subsequent service, spreads to failure.* In this article the tendency of metal to withstand a considerable number of slight plastic deformations without starting a de-

[1] Gough, H. J., Investigation of the Strength of Single Crystals: "Aluminum," *Philosophical Transactions*, Royal Society, A, Vol. 226, page 1 (1926); "Iron," *Proceedings*, Royal Society, A, Vol. 118, page 498 (1928); "Zinc," *Proceedings*, Royal Society, A, Vol. 123, page 143 (1929); also Vol. 127, page 453 (1930); "Antimony," *Proceedings*, Royal Society, A, Vol. 127, page 431 (1930).

[2] "Endurance Limit.—A limiting stress below which metal will withstand without fracture an indefinitely large number of cycles of stress. If the term is used without a qualifying adjective, the cycles of stress are usually such as to produce complete reversal of flexural stress."—1930 Report of A.S.T.M. Committee on Fatigue of Metals.

[3] See 1930 Report of A.S.T.M. Research Committee on Fatigue of Metals, *Proceedings*, A.S.T.M., Vol. 30, Part I, page 293 and page 295.

[4] Bulletin No. 165. University of Illinois, Engineering Experiment Station, page 18.

TICITY, A NEW PROPERTY OF METALS

By H. F. MOORE
Research Professor of Engineering Material, University of Illinois, Urbana, Ill.

THERE seems to be a property of metals, says this eminent authority, which is neither strength nor ductility as revealed by a tension test and which appears to be important, namely, the ability to resist fairly large numbers of loads which cause very slight plastic action, without starting a crack. He offers the term "crackless plasticity" to denote the property. Suggested methods of experimental study of this property include fatigue tests following a period of overstress, notched-bar impact tests and tests of the damping of vibrations in the metal.

structive spreading crack is spoken of as its "crackless plasticity."[5]

This crackless plasticity of steel is not dependent upon ductility *as ordinarily measured in a tension or cold-bend test*. Heat-treated alloy steel has a high elongation and a high reduction of area, yet seems to be relatively low in crackless plasticity. Elongation and reduction of area and good results in the cold-bend test are measures of the ability of steel to undergo *great* deformation under *one* very severe overload.

It is not at all certain that a steel which will resist one extreme overload without fracture until a high elongation is reached will resist *thousands* of small overloads without starting a spreading fatigue crack when each overload causes stress above the endurance limit of the material in some localized spot. Crackless plasticity may be regarded as a sort of ductility, although not the sort determined in the ordinary tension or cold-bend test.

If we have to coin a *name* for this property of steel, it is not surprising that we have at present no *tests* for the measurement of this property. It is natural to think of the notched-bar impact (Charpy or Izod) test in this connection, but here again we have no data on which to form a reliable judgment. There are some data available which show that high Charpy or Izod values indicate serviceability of steel for machines, but no definite quantitative relations have as yet been established.

It has been suggested by Dr. H. W. Gillett of the Battelle Memorial Institute, and possibly by others, that it would be worth while to have extensive investigation of the fatigue properties of various steels made something after this general plan: The endurance limit of a steel would be determined in the usual way, and then the endurance limit of specimens of the same steel which had been subjected to various degrees of overstress repeated for various numbers of cycles would be determined. This rather elaborate series of fatigue tests would then be repeated for each steel studied, and the reduction of endurance limit by overstress might furnish an inverse measure of the crackless plasticity of a steel.

Is Perfect Elasticity a Desirable Property?

Students of strength of materials have always thought of perfect elasticity as a *desirable* quality in a material. This statement, while generally true, may have certain exceptions when applied to metals to be subjected to repeated stress. Imagine a perfectly elastic axle running in a perfectly elastic bearing. The least variation from perfect alinement would mean extremely high localized stress at the edge of the bearing (See Fig. 2). What actually happens in such a case is a slight localized plastic distortion which greatly cuts down the magnitude of this localized stress. Now under repeated loading, or "fatigue," localized stress becomes of *major* importance as a potential source of a destructive fatigue crack. If we can have slight plastic action *without starting a crack*, we can have a good deal of adjustment and mitigation of localized stress and a material reduction of the danger of fatigue failure.

We may consider this matter of the desirability of

[5] von Heydekampf (1931 A.S.T.M. preprints) has suggested the term "dynamic ductility" for the ability of a metal to withstand many repetitions of slight plastic action without starting a fatigue crack. The writer of this paper has preferred the less dignified, but more vivid, term "crackless plasticity."

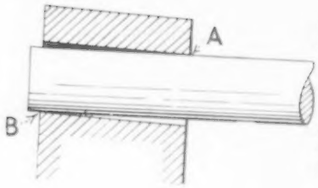


FIG. 2 — SHAFT IN MISALINED BEARING:—If both shaft and bearing were of perfectly elastic material, there would be enormous stress concentration at A and B. If either or both exhibit slight plastic action, this stress concentration is greatly mitigated.

crackless plasticity from another viewpoint. Well-dried plaster of Paris is a material which has very nearly perfect elastic action under stresses right up to fracture. There is almost no plastic action possible before fracture occurs. We can see that machine parts could not be made of such a material as plaster of Paris without very great danger of a fracture, on account of the absence of any appreciable amount of stress-mitigating plastic deformation. It seems pertinent to note again that the ability to absorb, by slight "crackless" inelastic action, the energy of stress adjustment is not a direct function of the ability to stretch under a single load before fracture occurs.

A method of studying this ability of a metal to adjust and mitigate localized stress by plastic action would be the study of cycles of stress and strain using extremely delicate load and strain-measuring apparatus. At some point well below the stress ordinarily accepted as the "elastic limit," cycles of stress and strain when plotted show hysteresis loops as shown in Fig. 3. However, the width of the hysteresis loops at such low stresses are measured in hundred-thousandths of an inch, they probably vary in width with the number of cycles of stress applied, and the direct determination of the area of such "hysteresis" loops demands extremely delicate apparatus and test methods.

Measuring the Damping of Vibrations

It has been suggested by O. Föppl of Brunswick, Germany, that the cumulative effect of such hysteresis loops may be measured by a rate of damping out of vibrations in specimens of the metal, and he has devised an apparatus for measuring such damping of vibrations which has been introduced into this country by his pupil, Dr. von Heydekampf.[6] The aparatus is shown in diagram in Fig. 4. The specimen S can be twisted slightly by the action of the two magnets M_1 and M_2. When the current in the magnet coils is broken, the specimen vibrates back and forth and a record of its vibrations is made on the paper P, which is moved by clockwork. Fig. 5 shows some typical records from such a machine.

[6] See 1931 preprints, A.S.T.M., "Damping Capacity of Materials," by von Heydekampf.

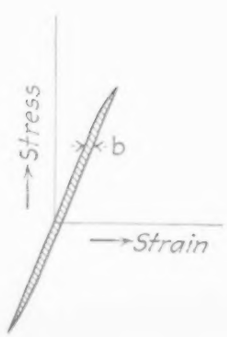


FIG 3.—STRESS-STRAIN DIAGRAM SHOWING MECHANICAL HYSTERESIS LOOP:—The width B is greatly exaggerated in this figure over the width which would be shown on a diagram for a test of a steel specimen plotted to a scale which would give this general shape of diagram.

The record of duralumin is of special interest. It has been found very difficult with duralumin to detect any metallographic evidence of plastic action (such as slip bands, visible under the microscope) before a crack is developed under repeated stress. Duralumin, while strong and fairly ductile as shown by tension tests, cracks relatively easily. It is to be noted that its vibrations show very slow damping; that is, there is very little energy absorbed in each vibration. Comparing its diagram with that of structural steel, the greater *damping* qualities of the latter are evident.

Heat-Treated Alloy Steels Show Little Crackless Plasticity

Heat-treated spring steel again shows comparatively little damping, as does heat-treated alloy steel.

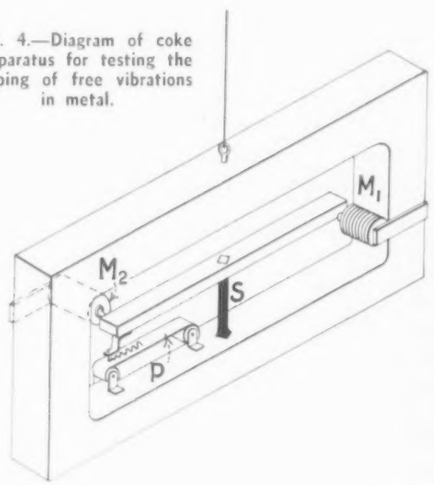


FIG. 4.—Diagram of coke apparatus for testing the damping of free vibrations in metal.

The ductility of alloy steel (as measured by elongation or reduction of area in the ordinary tension test) is much higher than that of heat-treated spring steel. Both heat-treated spring steel and heat-treated alloy steel are very strong; heat-treated alloy steel is ductile according to tension test results; but neither steel shows a high degree of "crackless plasticity" under repeated stress.

This crackless plasticity of steel may have some bearing on the preference which many engineers have for the use of wrought iron or soft steel to resist repeated stress. Such preference is usually found in such fields as railroad work, where the machine or structural parts are *occasionally* subjected to unusually heavy loads of unknown magnitude. These loads make up only a small proportion of the total number of loads applied in service and the ability of material to resist such occasional loads with adjustment of stresses by crackless plasticity may, quite possibly, be fully as important as actual strength.

Here again it becomes evident that ductility, measured by elongation or reduction of area, does not seem to insure crackless plasticity under occasional repeated heavy load. Taking a rather marked case, some of the copper-nickel alloys show a good elongation and reduction of area but do not seem to be able

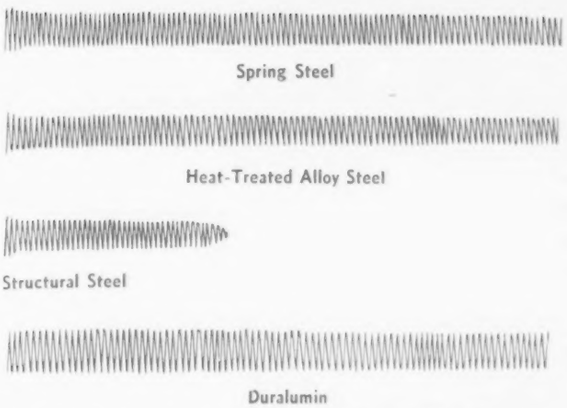


FIG. 5.—DAMPING TEST DIAGRAMS FOR VARIOUS METALS:—These diagrams are not taken from any definite tests, but are typical of the general type of diagram obtained for each metal.

to absorb much energy plastically without starting a crack.

It may be pointed out that, even if a metal possesses a high degree of crackless plasticity, yet under repeated loading this plasticity may be gradually exhausted. But, after a few cycles of stress, this exhaustion would be prevented, or at least delayed, by the progressive mitigation of localized stress due to the plastic action of the first few loadings. Plastic action tends to equalize stress, and to reduce the stress-peaks in a piece of metal under subsequent loadings. As the number of loadings increases the intensity of localized stress diminishes, *unless a crack starts*, and less and less will be the drain on the remaining crackless plasticity of the metal. If, however, a crack starts, it tends to keep up a state of stress-concentration at its end, and the mitigating effect of plasticity is absent, or at least markedly reduced. The analogy of the "breaking in" of the shafts and gears of an automobile is of interest in this connection.

Crackless Plasticity and Notched Specimens

Another indication of the importance of crackless plasticity of metals is found in the behavior of notched specimens under repeated stress. According to the theory of elasticity the percentage of reduction of strength due to a given notch should be the same whatever the material of the specimen. Actually this is very far from the truth. Very pure metals and very fine-grained metals seem to be the most sensitive to the effect of notches.

This sensitiveness to notch effect has been called "tenderness," although this term has no technical standing. Whether this question of tenderness to notch effect is connected with the crackless plasticity of steel and whether the results of notched-bar impact tests are correlated with this property of steel are questions which seem worthy of investigation.

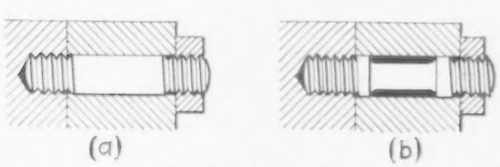


FIG. 6.—TWO TYPES OF STUD BOLT:—Type (a) failed in service in connecting rod of steam engine; type (b) gave satisfactory service.

Perhaps in this connection it may be of interest to consider the contrasting conditions of service for helical springs and for bolts. In helical springs, while there is some stress concentration and rather poor surface conditions, the stress concentration is comparatively low, while in bolts the stress concentration at the roots of the threads is very high.[1]

FIG. 7.—TWO TYPES OF GROOVED SPECIMEN FOR FATIGUE TESTS UNDER REPEATED STRESS:—Specimen (a) developed higher fatigue strength than did (b). The thread on (a) and the groove on (b) were cut with the same lathe tool.

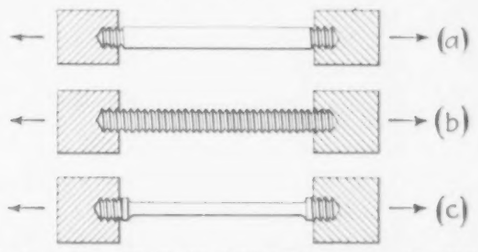


FIG. 8.—THREE TYPES OF SPECIMEN TESTED IN TENSILE IMPACT:—Specimen (a) required much less energy to fracture it than either specimen (b) or specimen (c).

Moreover, for springs stops are usually provided so that there is a limit placed to the stress which can be developed in the spring, while no such mechanical limit exists for a bolt in tension. For springs it is usually important that any permanent set should be very slight, while for bolts the minute plastic action at the root of the threads usually causes no direct trouble, so long as no crack is started.

In springs, then, the reasons for the current practice of using a very strong, rather brittle steel are obvious; a high elastic strength is necessary, no very large amount of stress concentration is present, and the stress which can be developed is usually limited. In the bolt, on the other hand, some degree of plasticity at the roots of the threads is nearly always present, and this does no harm so long as a spreading crack is not started.

Breakage of Bolts in the Sweet Engine

In this connection the experience of John E. Sweet with the old "straight-line" steam engine and the recent tests of R. R. Moore are of interest. In his early engines Mr. Sweet had much trouble with the breakage of bolts in the connecting rod. He replaced the soft steel bolts with a stronger steel and the trouble continued. He then reduced the shank of the bolt, as shown in Fig. 6, so that the area of the shank was no greater than that at the root of the thread. This stopped the trouble. It enormously increased the volume subjected to slight elastic action and consequent-

(*Concluded on page* 721)

[1] Experiments at the University of Illinois, as yet unpublished, indicate that the localized stress at the root of a screw thread may be three or four times the average stress at the root of the thread (load divided by area).

HEAT TREATING, FORGING AND MELTING WITH ELECTRICITY

By GLENN COLEY
Detroit Edison Co.,
Detroit

WITH a connected load of 85,000 kw., the Ford Motor Co. is described as the largest user of electric heat in the world. Electric heat is used in the forging department and in the heat treating of many vital parts of the Ford cars and trucks. Some of the features of these large and small furnaces are described by the author. There is also a brief account of the electric furnaces for duplexing blast furnace and cupola iron in the foundry, and of indirect arc furnaces in the brass foundry.

THE Ford Motor Co. is the largest user of electric heat in the world, having about 85,000 kw. in connected load. Of this amount over 15,000 kw. was added during 1930 and further expansion is being made continuously. This load would be sufficient to supply all of the electrical needs of a city of 150,000 population. The Ford company uses electric heat wherever possible, although it produces about 6,000,000 cu. ft. of 500 B.t.u. coke-oven gas per day.

Manufacturing tolerances on various heat-treated parts are close, being rigidly held during processing. Some Ford parts have probably the highest unit stresses upon them of any car on the market. Ford engineers can design these parts with lightweight sections without having to worry about possible failures, because of the materials used and the precision with which they are heat treated.

A Furnace Is Just Another Machine

The straight-line production methods at Dearborn are the model for many plants doing similar

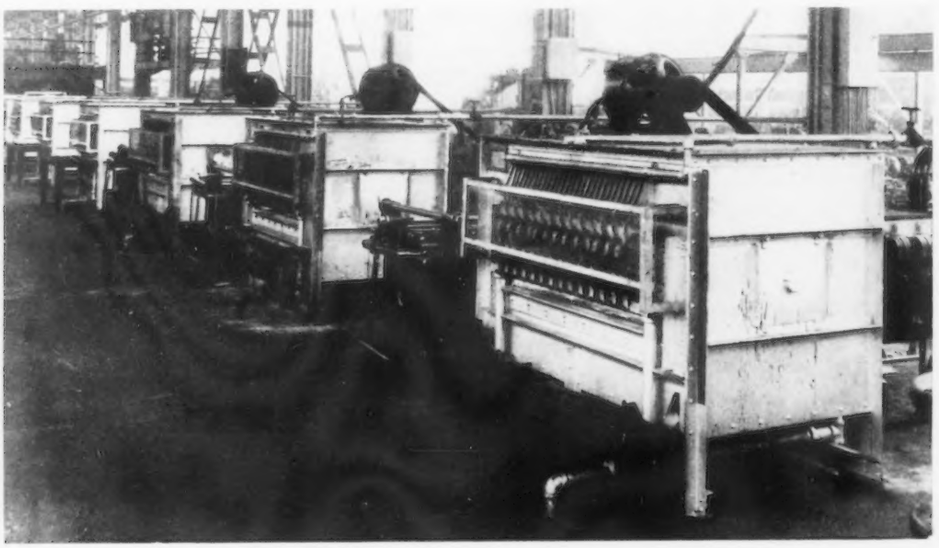


FIG. 1—A row of 60 silicon-carbide rod resistor furnaces for heating forging stock in the upset department.

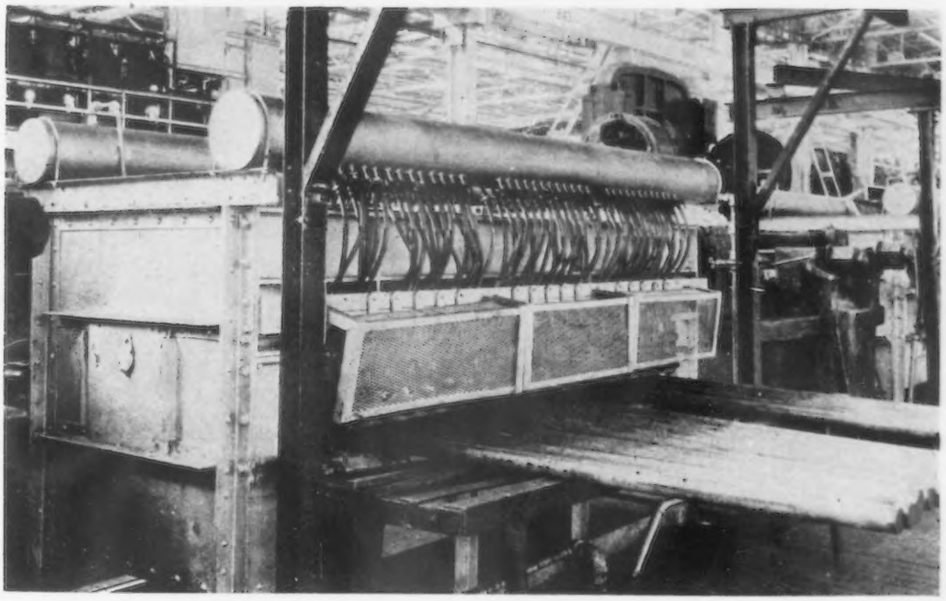


FIG. 2—A close-up of one of the 60 furnaces in Fig. 1 with rear axle drive shafts in position for heating before upsetting.

work. Any machine to find application here must fit into this line, and a furnace is looked upon as just another machine. Electric furnaces fit into this scheme because they are clean, compact, do not heat up the surrounding shop and produce an accurately heat-treated product with a minimum of labor and upkeep. Some of the more interesting applications of electric heat are described in the following paragraphs.

Sixty Furnaces in Upset Forging Work

Sixty silicon-carbide rod resistor furnaces for heating forging stock are installed in the upset department. The gear end of the truck rear-axle driveshaft is heated for upsetting in rod resistor furnaces shown in Fig. 2. This type of furnace has a front slot 5½ ft. long and 2 ft. deep, with an opening that may be adjusted to give a width of 2 to 4½ in. It is equipped with 18 rod resistors 1⅝ in. in diameter and 28 in. long, and has a connected load of 320 kw. The stock loaded by hand is 2⅛ in. in diameter and is heated for a length of about 9 in. The furnace is operated at about 2300 deg. F.

Forgings for the cluster gear of the transmission are heated in a continuous furnace (Fig. 3). Billets 2 in. in diameter and 12 in. long are placed, with their axes at right angles to the length of the furnace, on rails at the charging end. The walking beams, shown by the four levers on the side of the furnace, move up, forward and down, depositing the billets on the rails again. The walking beams are returned to their place by the single lever shown in the picture between the two left-hand beam levers. The work is discharged by gravity into a chute. The walking beam is so evenly balanced and smoothly

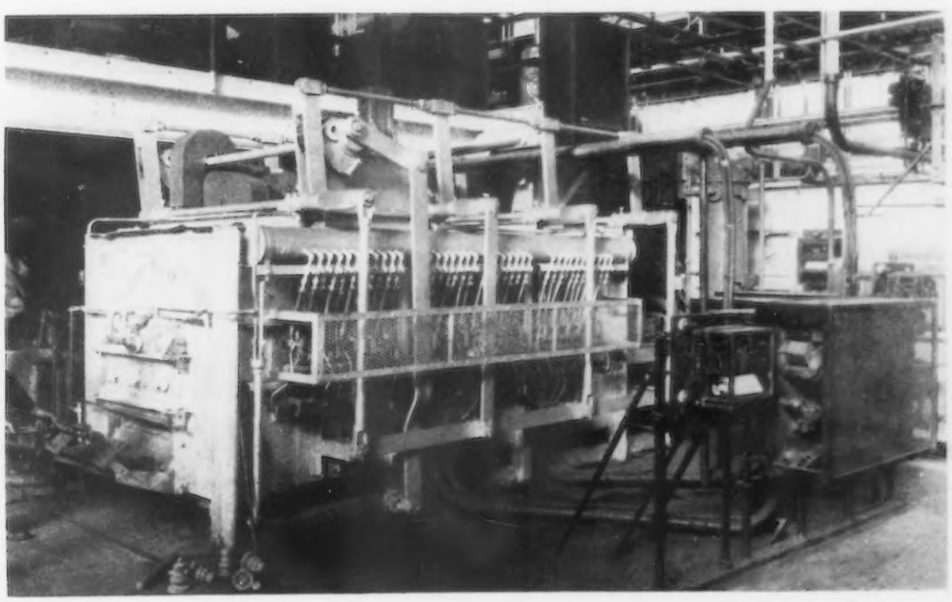


FIG. 3—A continuous furnace heats the forgings for the cluster gear of the transmission of the Ford car.

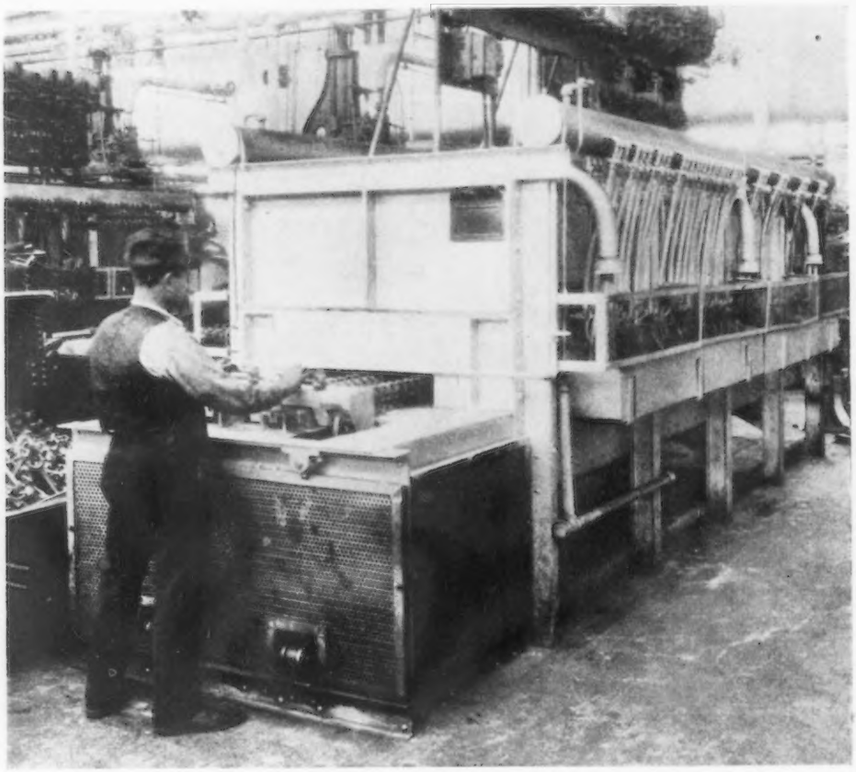
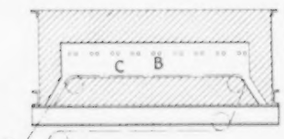
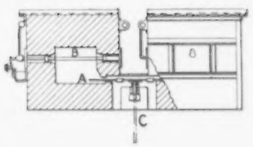


FIG. 4—This furnace heats connecting rods before restriking after drop forging and trimming. It will heat 1500 rods an hour, supplying two hammers.

FIG. 5—This leaf spring eye-bending furnace is really two furnaces with a chain conveyor between them. (at right)





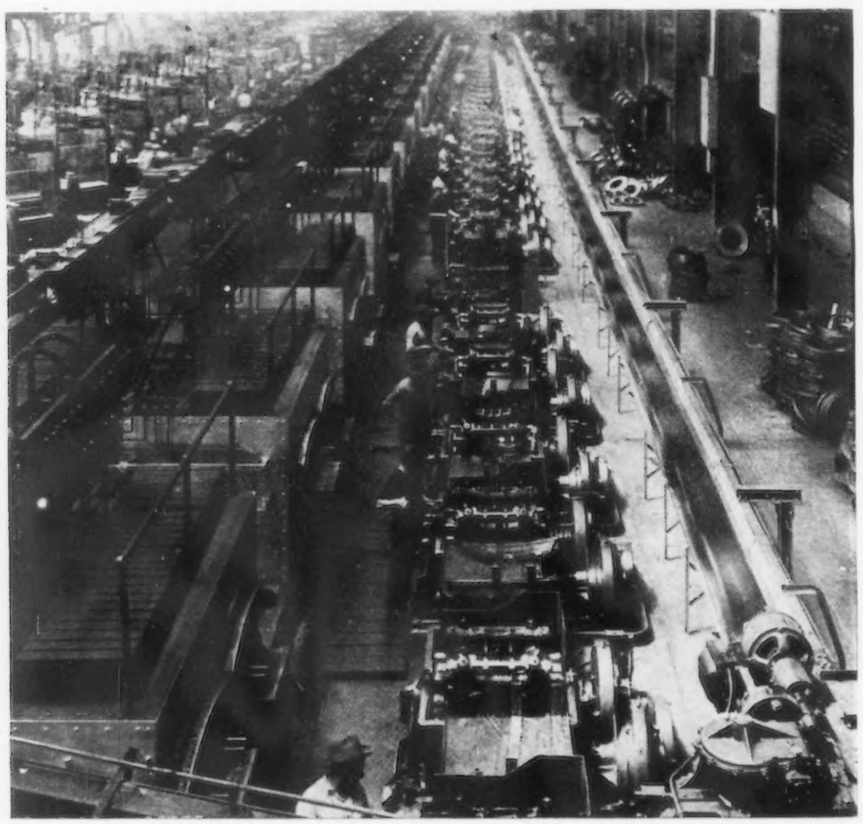


FIG. 6—In 74 furnaces of this type springs are hardened after the eyes have been formed.

operated that a billet standing on its end will complete the cycle without being tipped over.

The furnace is equipped with 36 rod resistors 1⅝ in. in diameter and 36 in. long, with a connected load of 540 kw. The resistors are mounted over the hearth extending across the width of the furnace, which is operated at about 2300 deg. F. Since the temperature is automatically controlled, it is possible

motor-driven pusher type. Two rows of connecting rods are on edge on alloy rails at the charging end, and the pusher, just under the operator's hand, moves forward a specified distance, after which it returns to its original position for more work to be placed on the rails. The rods are loaded and unloaded by hand. This furnace has 18 rod resistors 1⅝ in. in diameter and 36 in. long with a connected

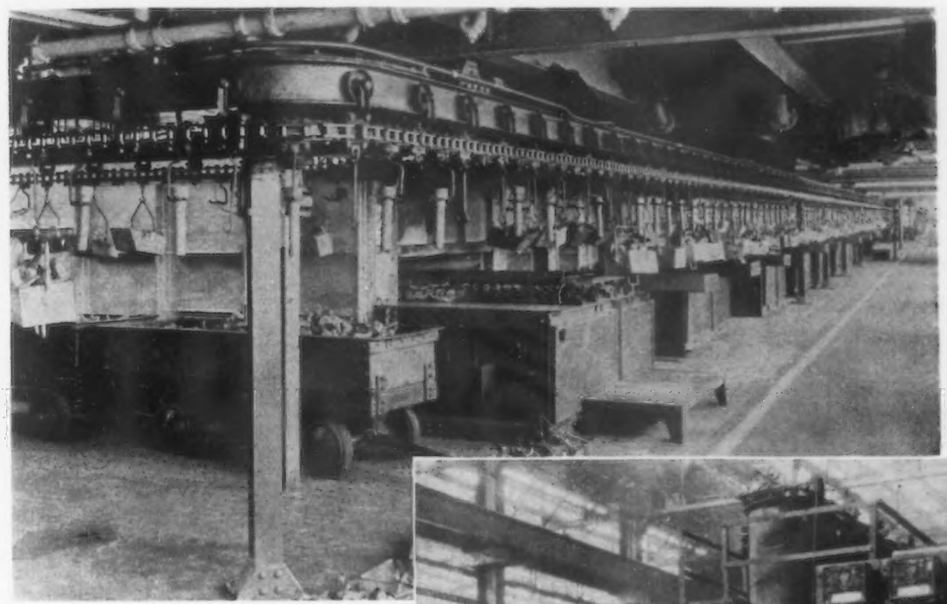


FIG. 7—(Above) Front of a battery of electric annealing and normalizing furnaces, affording an idea of the magnitude of the installations and the methods of transporting stock around the plant.

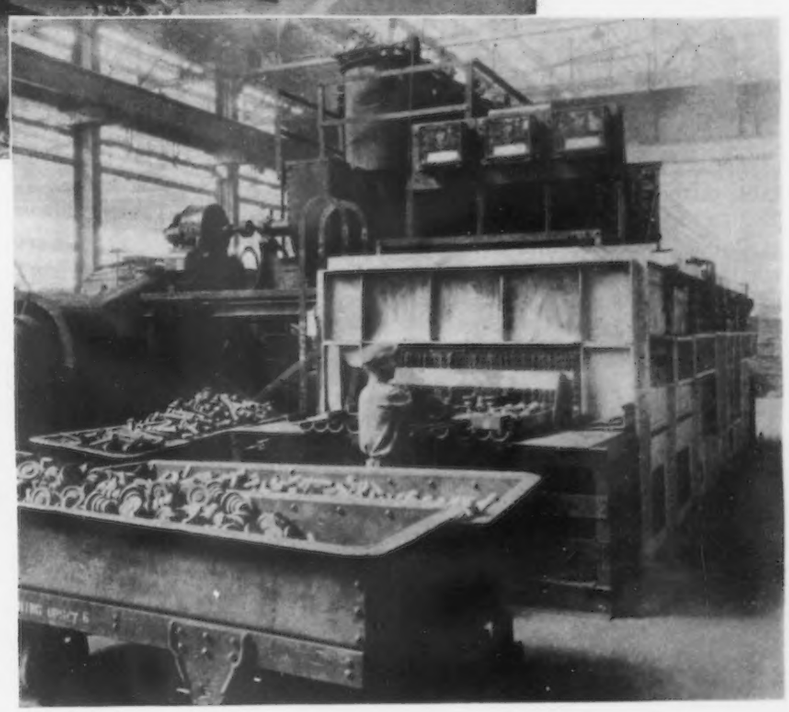


FIG. 8—(Below) Transmission gears and miscellaneous parts are annealed in this counterflow furnace, 26½ ft. long. It produces 16 to 20 lb. per kwhr.

to give the steel a thorough soaking heat without and wear on the dies. This furnace heats 350 billets, or approximately 3500 lb. of steel, an hour at danger of burning, making it possible to fill out this intricate forging with a minimum amount of power a rate of about 5½ lb. per kw.-hr. and feeds two upsetters.

Fig. 4 shows a furnace used for heating connecting rods before restriking, after they have been drop forged and trimmed. This furnace is of the

load of 300 kw. It will handle 1500 connecting rods an hour at a temperature of 2000 deg. F., supplying two hammers.

The furnace for bending eyes in the ends of leaf springs is in reality two furnaces with a chain conveyor between them. The width of the unit, as shown in the right-hand sketch in Fig. 5, is about 9 ft. The slot between the two halves of the unit is 1 ft. The actual hearth of the furnace is about 7 ft. and the charging point 4 ft. above the floor

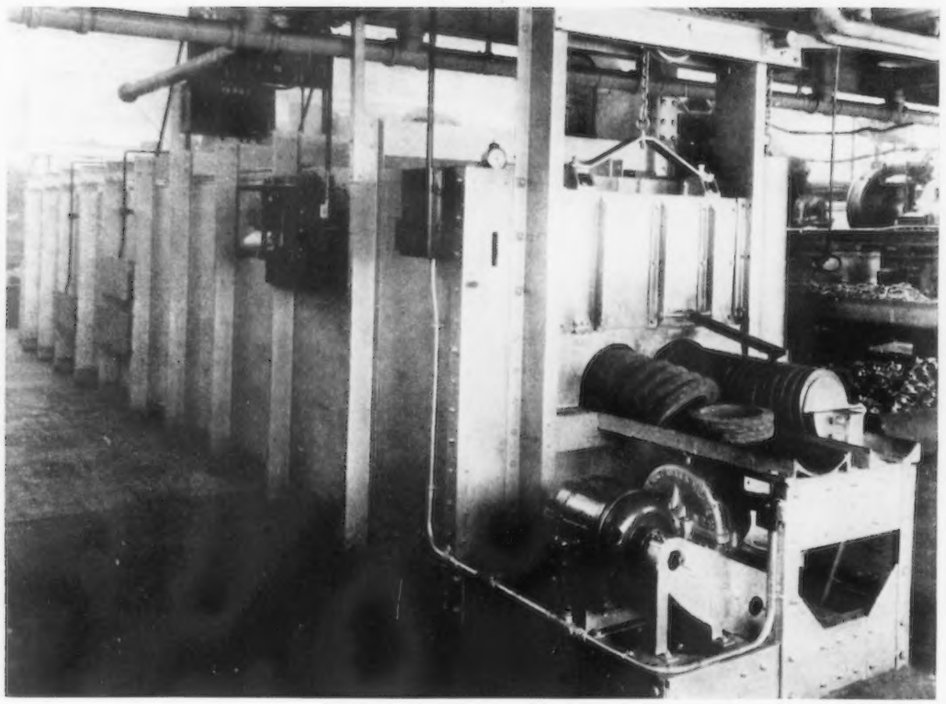


FIG. 9 — In this three-zone counterflow furnace, 32 ft. long, rear axle drive gear forgings are normalized. Output is 18 lb. per kwhr. net.

level. The heating elements are of the rod-resistor type and are located above the hearth, as shown at *B*.

The conveyor consists of a motor-driven series of flat plates with two stops extending upward on each plate to carry the stock through the furnace. The flat leaf spring stock is loaded on the conveyor at *D* and carried up into the furnace as shown at *A*, where about 3 in. of each end of the spring is heated to about 2000 deg. F. As the springs reach the discharging end, they drop down a chute to a level about even with the eye bending machines. After being discharged, they are placed in the bending machines where both ends are bent at the same time. This furnace has 18 rod resistors 1¼ in. in diameter and 22 in. long, with connected load of 360 kw. The furnace will produce 240 springs an hour.

After having the eyes formed, the springs are hardened by heating in one of a battery of 74 furnaces shown in Fig. 6. These furnaces are imme-

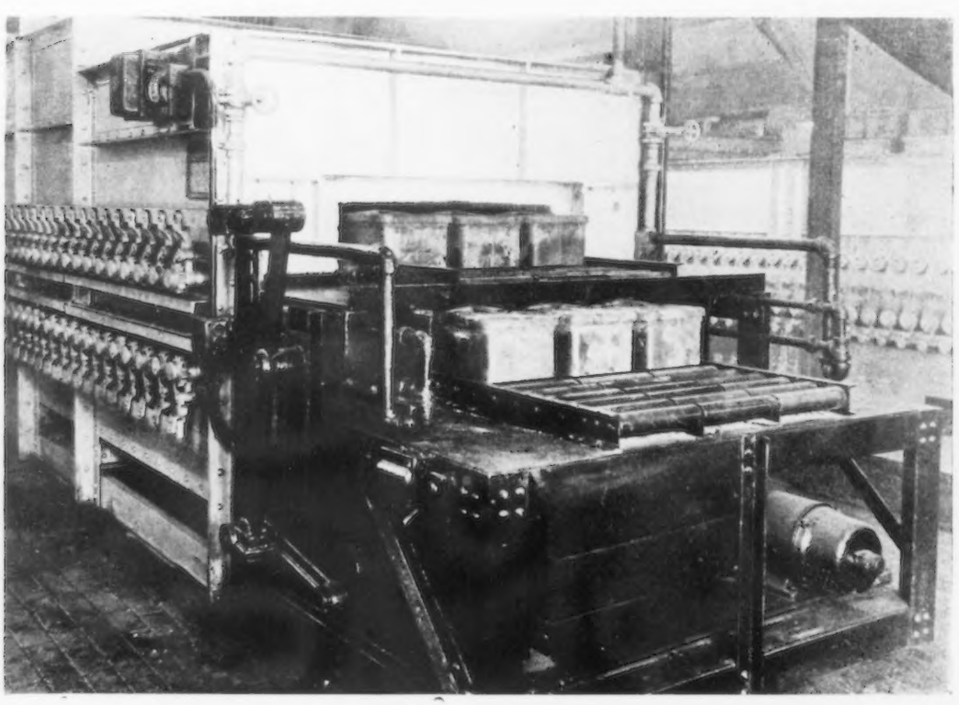


FIG. 10—A double-deck roller hearth furnace for carburizing wrist pins. The double-deck is resorted to to save space.

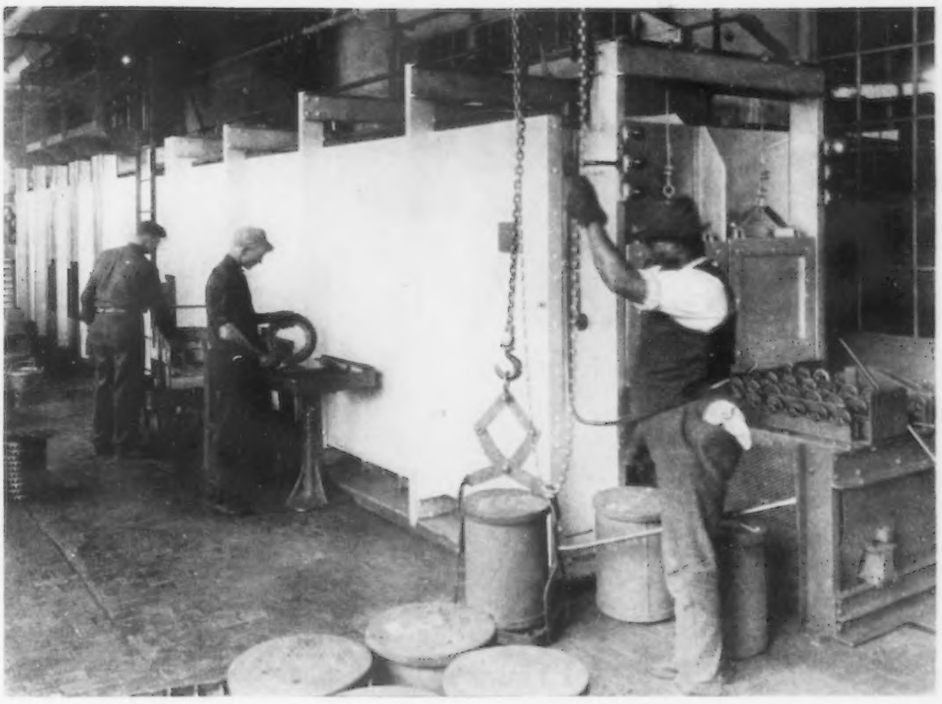


FIG. 11 — In this counterflow furnace of the pusher type, ring gears for Ford trucks are carburized. The hearth is about 61 ft. long. Ring gear forgings are normalized in a furnace of the type shown in Fig. 9.

diately behind the men shown in the picture and are of the chrome-nickel resistance type. Springs are put through the furnace by a walking beam and after being heated are quenched in fixtures which form the springs at the same time that they are quenched.

Transmission gears and miscellaneous parts are annealed in a counterflow annealing furnace, Fig. 8. The work moves through the furnace in two paths in opposite directions so the hot work coming out gives up some of its heat to the cold entering work. Parts are discharged at a temperature of 700 to 1000 deg. F. depending upon the speed of the pusher. Transmission gears are loaded directly on the grooved rails, while miscellaneous parts are loaded on trays. A man at each end of the furnace loads and unloads the work. The chamber of this furnace is 26½ ft. long, 2 ft. 11 in. high and 5¼ ft. wide, with a connected load of 420 kw. and three zones of control. The furnace will produce 16 to 20 lb. net per kwhr.

Rear axle drive gear forgings are normalized in a novel furnace of the metallic resistor, counterflow type. It has an overall length of 32 ft. with a central heating zone 16 ft. long. There are three zones of control and a connected load of 160 kw. Gear blanks are pushed through on edge in alloy troughs. The right-hand row of gears enters the furnace as the left-hand row leaves. With this type of pusher, all material going through the furnace is on a production basis; hence an output of over 18 lb. per kwhr. net is obtained.

Fig. 10 shows a double-deck roller hearth furnace for carburizing wrist pins. Three rows of boxes are placed in each deck, the decks moving in opposite directions. This gives the same recuperative principle as in the more common single-deck, alternate-row furnaces. Proper spacing of the heating elements in the two decks gives a uniform distribution of temperature. Boxes are placed on the rolls by a monorail chain hoist. Before packing in the carburizing compound, alloy plugs are inserted in each end of the pins to prevent carburization in the hole. The double-deck principle was resorted to in order to save space.

Ring gears for Ford trucks are carburized in

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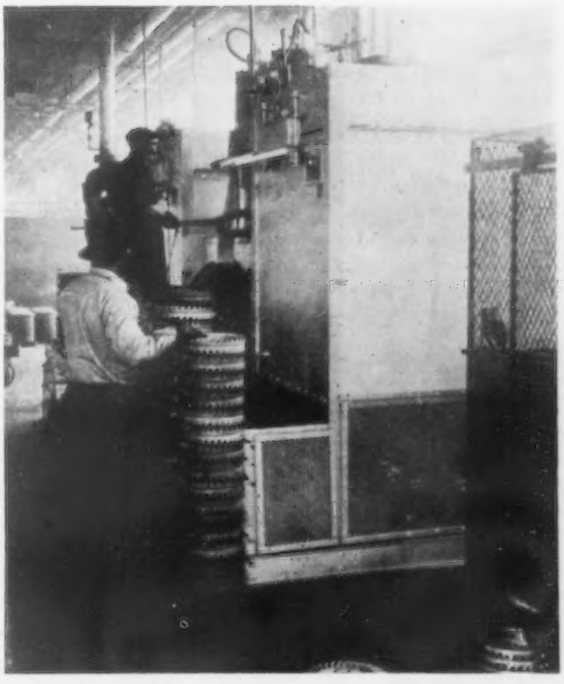
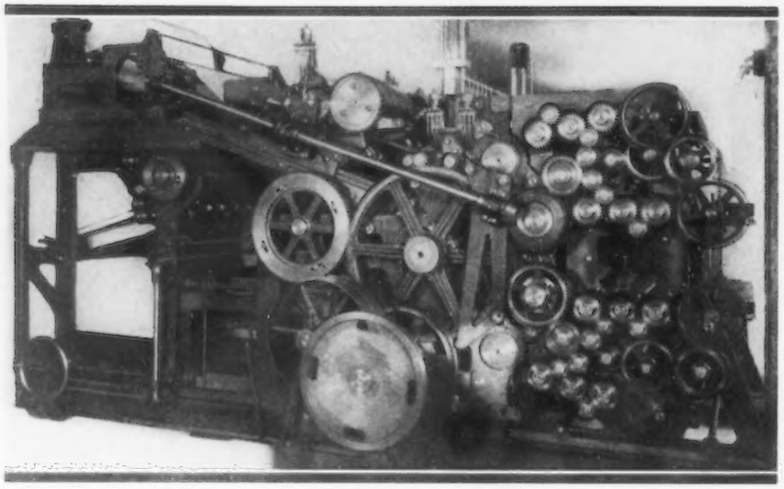


FIG. 12—After carburizing the ring gears are hardened in this vertical semi-continuous furnace.



(Left).—There are more than 60 gears on this side of this high-speed rotogravure press. They are not usually visible.

HEAT TREATMENT ASSURES DEPENDABLE GEARS

GEARS in aeroplane engines and in machines in general are usually not prominent. But to the specialist in machinery and in machine design, and also to the airplane pilot, they are of more than prime importance. Gears in such products have been likened to the heart of the human body; to the pilot of the aeroplane they may mean life or death.

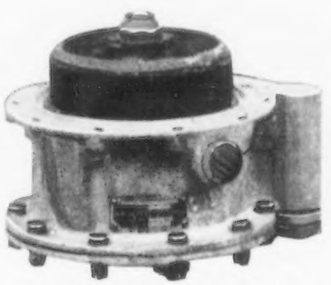
In all the notable achievements in aviation, past and present, gears have played a prominent part. Attempts to span oceans and continents in the air would not have been so successful, if gears as vital parts had failed because of poor metal, faulty heat treatment or other reasons. In printing presses gears are also a major necessity, and their number, complexity and variety in some large presses are surprisingly large.

A Boston institution, the Meisel Press Mfg. Co., has been producing gears for over 20 years. This company for some years has been supplying aircraft corporations, large press builders and other companies with its gears, besides making them for incorporation in its own printing presses. Some of these presses weigh up to 40 tons. Gears are also used in the company's small numbering machines, weighing as little as 6 oz.

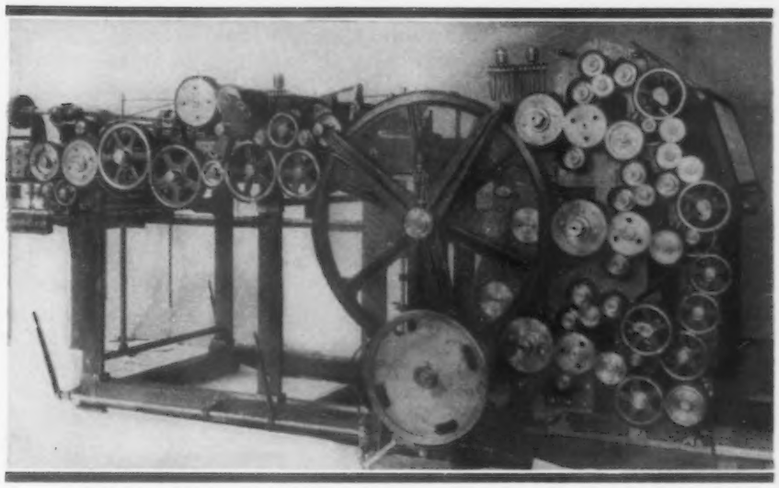
The printing presses are used in the production of mileage books, bills of lading, sales books, trolley car and rapid transit tickets and transfers, baggage checks, theater tickets, can wrappers and labels, and milk bottle caps and cellophane products, which involve operations such as punching, perforating, drying, demagnetizing, creasing, folding, numbering, stacking, printing, slitting and rewinding. The Meisel company also manufactures presses for high-speed production of color and rotogravure printing.

Its plant is completely equipped with the most modern facilities for machining operations and a heat-treating department which can meet the exacting conditions necessary in the production of gears.

The gears must not only be carefully heat treated, but their proper composition must be exactingly stipulated. While there are many kinds of steels from which gears are made, there are eight approximate



GROUP of timing gears essential to an airplane engine. This type is used in Army, Navy, mail, altitude, speed and transportation planes. The set includes the two gears at top of these pages.



(Right)—The other side of the rotogravure press. Over 60 gears here also.

GEARS are so vital to the successful functioning of aeroplane engines, of large and small printing presses and of many other intricate machines that their composition and heat treatment must be carefully stipulated. This article tells something of the practice of a manufacturer of large printing presses that produces such gears on a large scale for its own use, as well as for makers of aeroplane engines and heavy machinery. The heat treatment and a program of control by which the metallurgical and heat-treating history of every piece can be traced are outlined.

compositions generally used. There is the plain low-carbon steel, 0.10 to 0.20 per cent carbon. Then there are three low- carbon nickel steels, ranging in nickel from 1.25 to 5. 25 per cent. There are also low-carbon nickel-chrome, chrome-vanadium, nickel-molybdenum steels and a fairly high nickel-chrome steel very low in carbon.

Heat treatment prescribed for gears in general follows certain comprehensive rules of recommended practice, varied to suit the steels used. The gear blanks are usually annealed after forging and before machining. The time for heating and the temperatures, as well as the method of cooling, also vary. An important step is carburizing or case hardening, followed by heat treatment, both processes being varied to suit special conditions. For each of the eight types of steel referred to, the carburizing temperature, the quenching medium and the reheating temperature, followed in some cases by further quenching and reheating, vary according to the composition of the steel and to the structure and properties desired.

It is manifest that to attain these results a complete heat-treating and hardening department is essential. Some of the illustrations give an idea of the equipment of the Boston company available for the purpose. In addition to this department, there is necessary a complete line of equipment for machining, shaping, grinding and processing in general before the gears reach the last stages of perfection.

A feature of the manufacture of gears by the Meisel firm is the scheme it has perfected, designated as "heat treating by program control." Some of the main points in this rather detailed program have been obtained from S. A. Smith, manager of the company's gear department.

It is sometimes necessary to know from what mill heat of

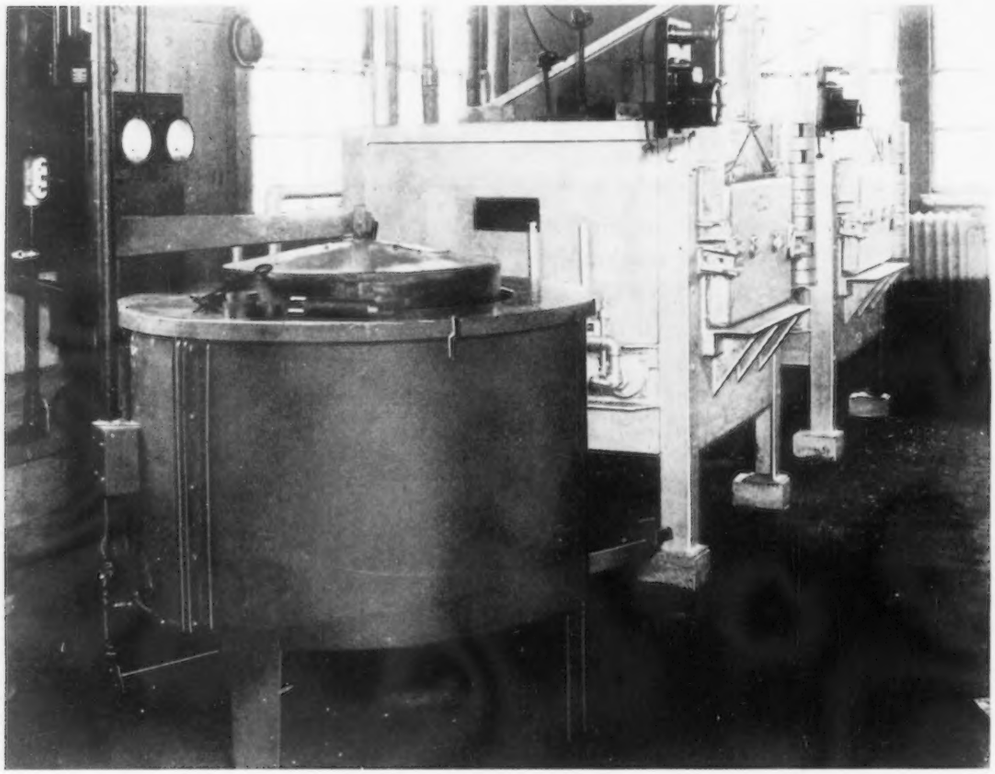
steel certain products were made so that they can be reliably traced. To attain this aim, the heat number is stamped on the steel, usually in bar form, and it is retained or transferred on this product in all stages of production. It is even finally found on the finished product. This is also the practice in the case of forgings. A smaller or practical number, or symbol, can also be used, which is tied up with the heat number in some manner.

Therefore if any part breaks while in use or during experimental tests, or if undue wear or other bad features are prematurely visible, the piece can be traced to the original heat and all other pieces or gears made from that batch of steel can be recalled, if necessary. Should research prove that the steel was the cause of the trouble, this fact is a guide to the steel maker in obtaining better results in the future or in replacing the material. Should the steel mill be exonerated, then it is possible to refer to the record of heat treatment through which the piece has passed and locate and correct the error.

A product upon which life itself depends, such as an airplane engine, must be given the most careful attention. By the system used at the Meisel plant, a reliable record is available which leaves no doubt as to what was done to each piece of steel and how it was done. A piece from a product, representing its heat number, is always available for each quantity of that product as a test piece of the heat treatment applied.

Fifty pieces are often used as a quantity. In such a case, if the product is made from bar stock, test pieces representing each bar are necessary. If 150 pieces are made from such a bar, three test pieces are selected from that bar. If forgings are used, one forging from a lot of 1000 from the same heat may be used if it can be cut into 20 parts so as to give one part for each 50 pieces of product. If only one test piece can be made from a forging, then 20 forgings must be used as test pieces for 1000 pieces of product divided into lots of 50 pieces.

It is important that test pieces shall be like the product so as to represent the same results from heat treatment. Disks and simple plain objects are not to be used as test pieces. It frequently happens that a test piece is almost 100 per cent completed so that it is, up to that stage, actually a product. It is then cut into as many parts as it will make test pieces or is left as a whole test piece.



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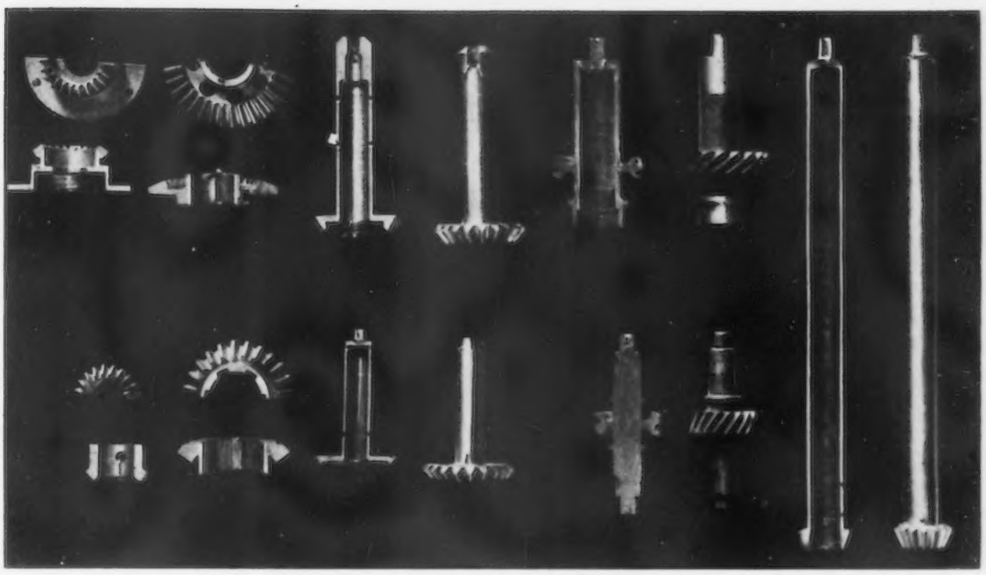
SPECIAL heat-treating furnace for gear stock with two large gas-fired units in the rear. Furnaces in this department are used for normalizing, annealing, spheroidizing, hardening, tempering, cyanidizing, and carburizing of simple, alloy and tool steels.

The stage that a product becomes a test piece is usually immediately after the step in the fabrication which makes it the portion of the product which carries the load or performs the most important role in the finished product. Thus in a gear the teeth, keyways and bearings are the important parts. After the last of these are made, the product can be cut into test pieces.

Two Basic Operations Involved

Samples of new materials, before being placed in quantity production, are machined and heat treated for all physical tests applied to the finished product. This includes all chemical tests. There are two main steps in the production program.

The first basic operation is to rough-machine the material to somewhere near the finished size and shape, removing all scale from the forging or bar



COMPLICATED nature of some of the gears made by the Meisel company. The thin walls reveal some of the heat-treating problems. The gears cut apart are from Hispano-Suiza engines used in the World War in single seater fighting planes on the French front. Whole gears are the same not cut apart.

material and leaving ample stock for subsequent operations. The second step has two objectives,—machineability and uniform or correct metallurgical structure, the latter being necessary to finally harden with minimum distortion and dimensional change.

These two basic operations are nearly always performed on alloy steels and nearly always on simple steels, regardless of the possibility that the material may have been annealed before reaching the gear maker. The second step may involve spheroidizing, normalizing or a refining heat treatment involving quenching and drawing. This is experimentally done to learn which will give the best metallurgical structure.

How to Judge Machineability

It has been found that, if a globular pearlitic structure gives the best machineability, it must be of such phase as to transform directly during the final hardening into the required physical properties, with minimum distortion and change of dimensions and without the necessity of going through phases that will endanger such results.

If the material after the second production step can be filed with good chips resulting from the use of both a fine cut and a coarse cut file, the machineability is nearly ideal. If either file produces a glazed surface, the condition is not satisfactory. It might, however, be within the range of acceptability depending on the hardness of the glaze. As a rule, if a glaze results from the fine cut file, the material is too hard. If the coarse file causes a glaze, the steel is too soft and stringy or too tenacious for good machineability.

"Control of machineability by means of hardness tests is not practical because a knowledge of the metallurgical structure is of prime importance. Broaching and planing operations should be the basis of determining good machineability rather than turning or milling operations," says Mr. Smith.

Special Numbers Indicate Each Stage

During the first rough machining operation, the mill heat number, usually called the lot number, is stamped somewhere on each piece of product. At this point there is introduced the first of the series of special numbers—in this case the machining plant's numbers—which show each stage of the manufactur-

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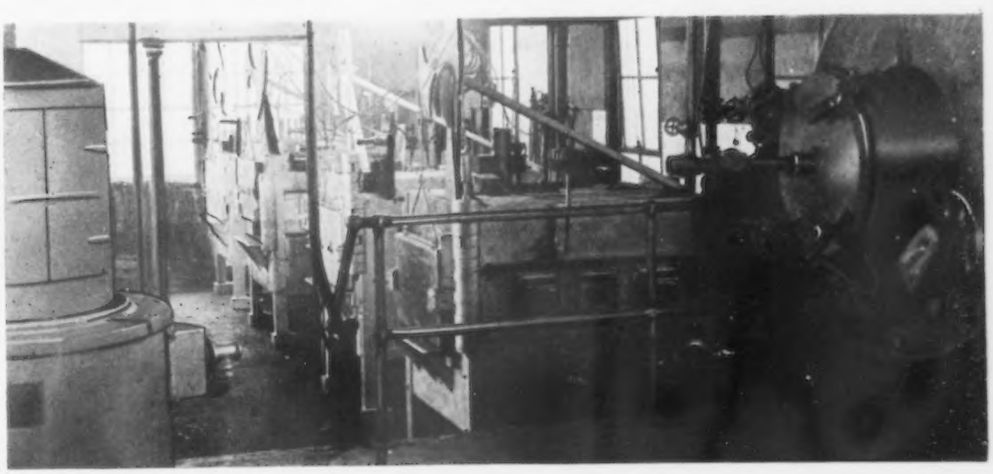

A ROW of gas-fired furnaces in the Meisel company's heat-treating department. One of several carburizing furnaces (right) and a special furnace at the left are also part of the equipment.

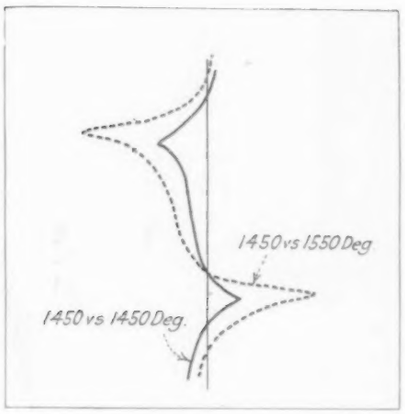

FIG. 1.—Oscillograph of strip steels quenched from different temperatures.

HEAT TREATMENT CHECKED BY MAGNETIC ANALYSIS

By LEWIS S. REID
Chief Engineer, Magnetic Analysis Corpn., Long Island City, N. Y.

MANY finished and semi-finished steel parts are made to specifications demanding a close heat treatment control. A quick non-destructive test which can be applied to the finished part to ascertain whether it has received the correct heat treatment, or has responded normally to it, is in all instances desirable and in many instances a necessity.

In this connection magnetic analysis has been used to some extent, and is being tried out and used to a greater degree as more knowledge of it is being acquired.

The apparatus employed consists of two magnetizing coils so constructed that magnetizing fields of equal intensity are produced. Suitable instruments are inserted in the circuit to control and vary the magnetizing force. Inside each of these coils is a small secondary coil which picks up the induced magnetism in the materials inserted in the large coils. These search coils are opposed and the bucked current is carried to an oscillograph, which measures, by a light wave, the differential rate of change of magnetism between the standard in the one coil and the specimen in the other coil. By inserting in the one coil a standard of known properties, the likeness or differences in the properties of the material inserted in the other coil will show up as a variation in the shape or amplitude of the light wave produced on the oscillograph screen.

Strip Steel for Razor Blades

A specific instance, showing what may be accomplished by magnetic analysis, is brought out in Figs. 1, 2 and 3. The material was strip steel used in the

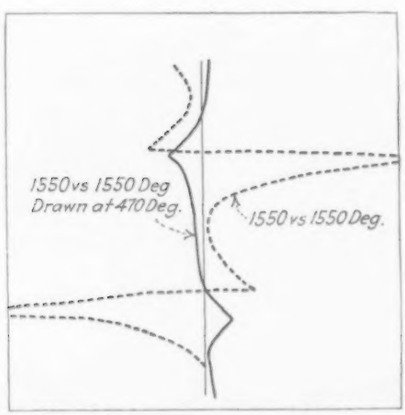

FIG. 2.—Oscillograph of a strip steel quenched and drawn.

FIG. 3.—Oscillograph showing the difference obtained on strip steels at different drawing temperatures.

SPECIFICATIONS for some products made of steel demand extremely close control of the heat treatment. Magnetic analysis now affords a quick, non-destructive test to ascertain whether such products have been correctly heat treated. This article reveals some applications of this test in checking the heat treatment of razor blade steel and in the patenting of wire.

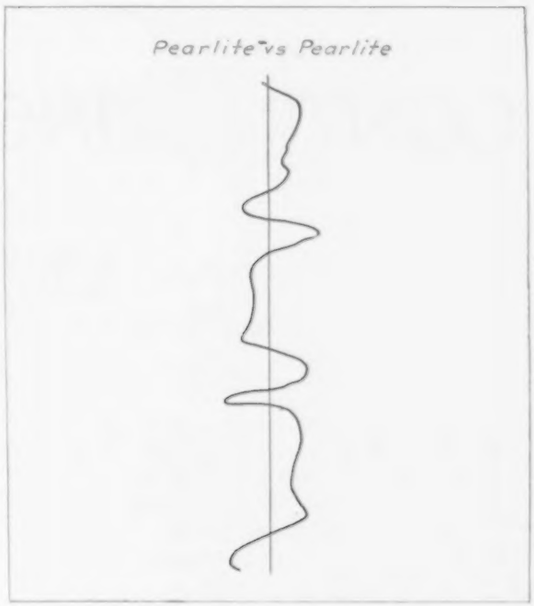

FIG. 5.—Oscillograph of wire having the structure of Fig. 4 compared with another piece of wire having the same structure.

manufacture of razor blades. Fig. 1 shows the difference of 100 deg. in the quenching temperature. The solid line is the one obtained when a strip quenched from 1450 deg. F. is compared to another strip quenched from the same temperature. The dotted line shows the difference when a strip quenched from 1550 deg. F. is compared with a strip quenched from 1450 deg. F.

Fig. 2 shows the effect on the curve of a strip which has been drawn. The solid line is that obtained when a strip quenched from 1550 deg. F. is compared with another strip quenched from the same temperature. The dotted line shows the curve obtained when a strip quenched from 1550 deg. F. and then drawn to 470 deg. F. is compared with a strip quenched from 1550 deg. F.

Fig. 3 shows the difference obtained by different drawing temperatures. The solid line was obtained by comparing a strip which was quenched from 1450 deg. F. and drawn to 410 deg. F. with a strip quenched from 1450 deg. F. The dotted line was obtained by comparing a strip which was quenched from 1450 deg. F. and drawn to 460 deg. F. with a strip quenched from 1450 deg. F.

Patenting of Wire and Magnetic Analysis

Another case where magnetic analysis has been used in connection with heat treatment is in the patenting of wire. Before the patenting operation the wire has a pearlitic structure, as shown in photomicrograph Fig. 4. When the wire having this structure is compared with another piece of wire having the same structure the curve, as shown in Fig. 5, was obtained.

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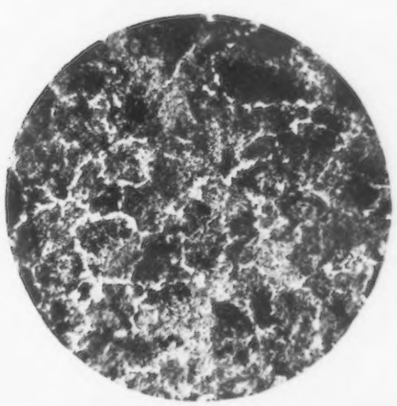
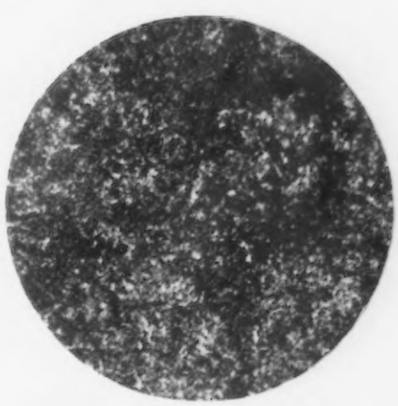


FIG. 4. — Pearlitic structure (left) of steel wire before the patenting operation.

FIG. 6. — Sorbitic structure (right) of steel wire after the patenting operation.



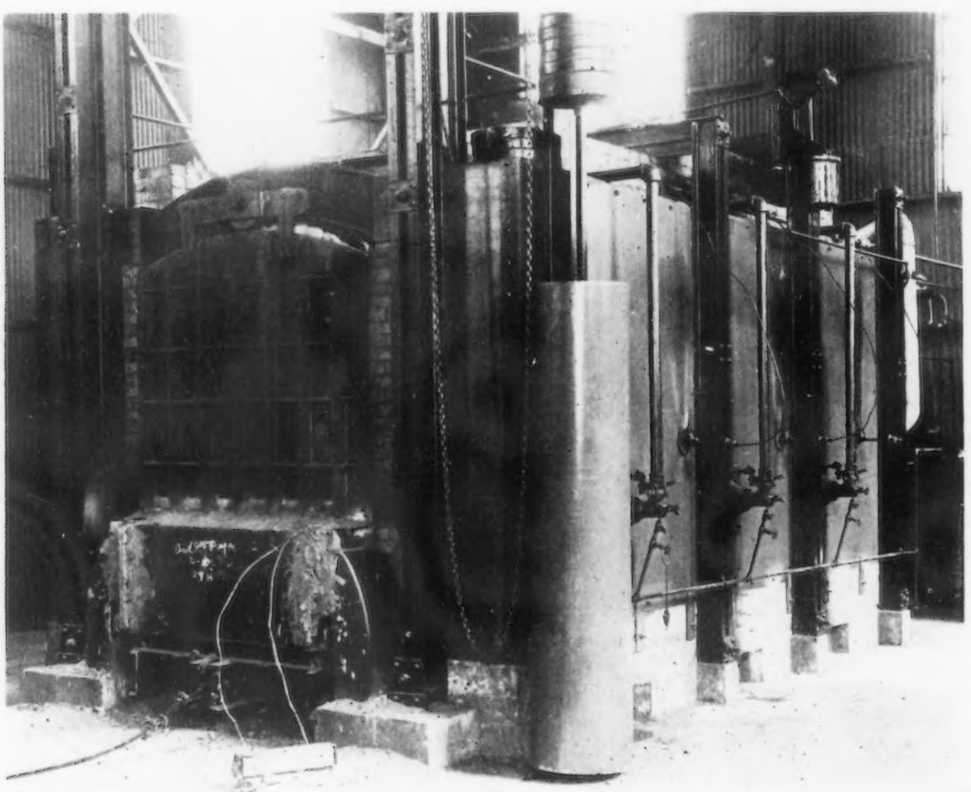
CONTROLLING THE ATMOSPHERE

By ROBERT M. KEENEY
Connecticut Light & Power Co.,
Hartford, Conn.

ULTIMATE solution of the atmosphere problem in some heat-treating processes has become a probability during the past year. Furnaces heated with fuel or electricity have been placed in plant operation in which, through control of the atmosphere, scaling and oxidation have been entirely, or almost entirely, eliminated during the heating of a number of metals and alloys.

Within the past decade, considerable progress was made in control of furnace atmosphere, but the major development in heat-treating furnaces was their conversion from simple furnaces to reliable production machines. Intensive research on the fundamental principles involved in securing the best furnace atmosphere for heat treating iron, steel and non-ferrous metals has aroused the interest of the metallurgist, furnace engineer and heating engineer to the point where the optimist tends to consider the conditioning of furnace atmosphere to be too simple—as simple as air-conditioning in the home. Although the practical application of control of furnace atmosphere doubtless will proceed slowly and with grief, as well as with the expenditure of much time and money, its present trend indicates ultimately a major development in heat treating with the production of a product improved in quality, requiring little or no cleaning.

Of course, the problem of controlling furnace atmosphere has been realized for a long time, but its



OIL-FIRED car furnace, developed by Ryan Scully & Co., bright-anneals cold-rolled strip steel under rustless steel hoods with producer gas atmosphere at Wallingford Steel Co., Wallingford, Conn.

IN HEAT-TREATING FURNACES

ULTIMATE solution of the problem of atmospheric control in heat-treating furnaces now seems certain, says Mr. Keeney, an authority in this field.

Practical application of such control will doubtless proceed slowly, he states, but it promises to become a major development in heat treating, resulting in improved products, requiring little or no cleaning. Some installations have been made in which scaling and oxidation have been largely eliminated. The trend is toward the use of artificial atmospheres, which are now finding increasing application for bright annealing.

Economies arising from atmospheric control include elimination of metal loss, avoidance of pitting resulting from pickling and a higher rate of production.

solution seems to have been delayed by a tendency to search for the answer through the source of heat, rather than through consideration of artificial atmospheres. Although automatic temperature control and combustion control have resulted in improved conditions of atmosphere in combustion furnaces, it is now recognized that for many heat-treating operations this method has limitations. In some furnaces, conditions have been improved by furnace pressure control as well as by temperature and combustion control, with automatic control of all vents in synchronism with combustion control. For many heat-treating operations, the atmosphere produced by control of temperature, combustion and pressure is satisfactory, viewed from present standards, but even in combustion furnaces there exists a trend toward the use of artificial atmospheres for a number of heat-treating processes. An artificial atmosphere or its combination with the combustion atmosphere may prove to be the solution in some operations.

In the electric furnace conditions are different. Except as its atmosphere may be changed by oil on the work or by emission of gases from the work at high temperatures, the electric furnace heats the work in a single fixed atmosphere unless an artificial atmosphere is introduced. In the electric furnace of the metallic resistor type, the furnace chamber normally contains comparatively inactive air and will be oxidizing until the 20 per cent of oxygen in the air has been consumed in burning oil on the work or any other combustible matter present or, in the absence of either, by combination with the surface of the work to form oxide.

If the furnace is air tight or has no great infiltration of air, oxidation stops and heating proceeds in an atmosphere which tends to be neutral or reducing if there was oil on the work when loaded. This situation and the lack of the constant movement of atmosphere which exists in the combustion furnace account for its ability to produce a product with a surface, satisfactory under present standards, in what is apparently an oxidizing atmosphere.

Although control of atmosphere in the electric furnace, beyond the equilibrium normally set up in its operation, must be secured through an artificial atmosphere, the electric furnace is not materially handicapped. Although on some applications the desired results may be secured in the combustion furnace without use of an artificial atmosphere, its results probably cannot be made as positive as would be the case with an artificial atmosphere, due to the numerous variables involved in control of atmosphere through combustion and pressure control. The electric furnace operated with an artificial atmosphere seems to have an advantage over the combustion furnace operated with an artificial atmosphere in the probability of easier application in design and lower maintenance cost.

Metallurgy Complicates Control of Atmosphere

The problem of control of atmosphere becomes complicated with the recollection that, in the case of steel, it is not simply necessary to avoid oxidation

CONTROLLING THE ATMOSPHERE IN

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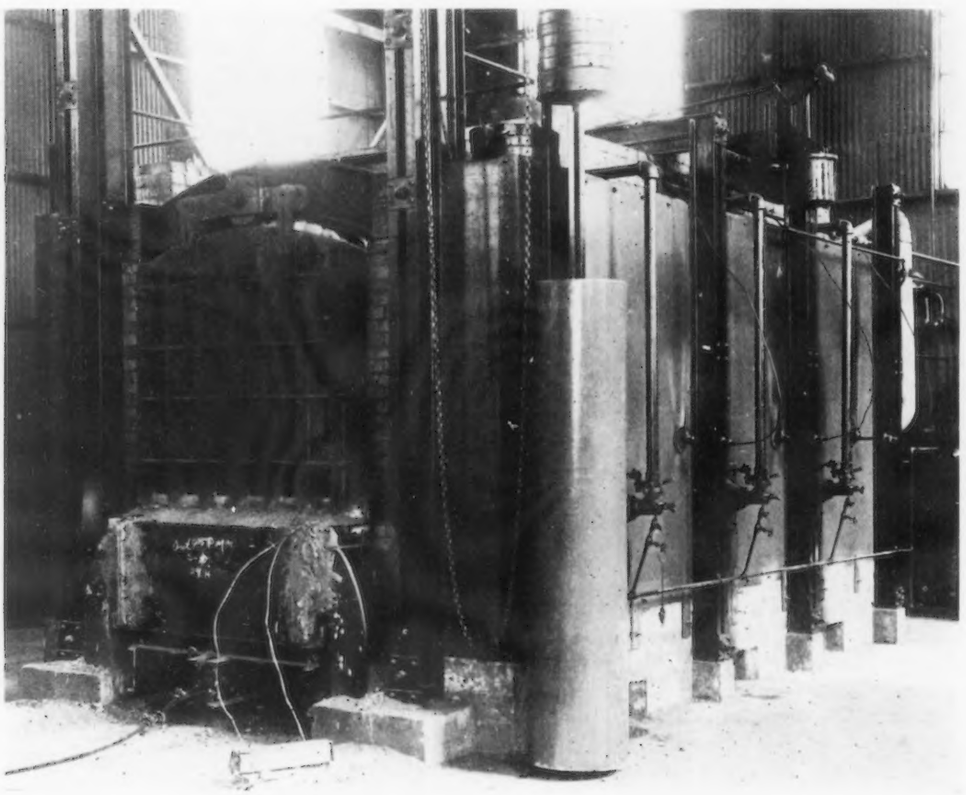

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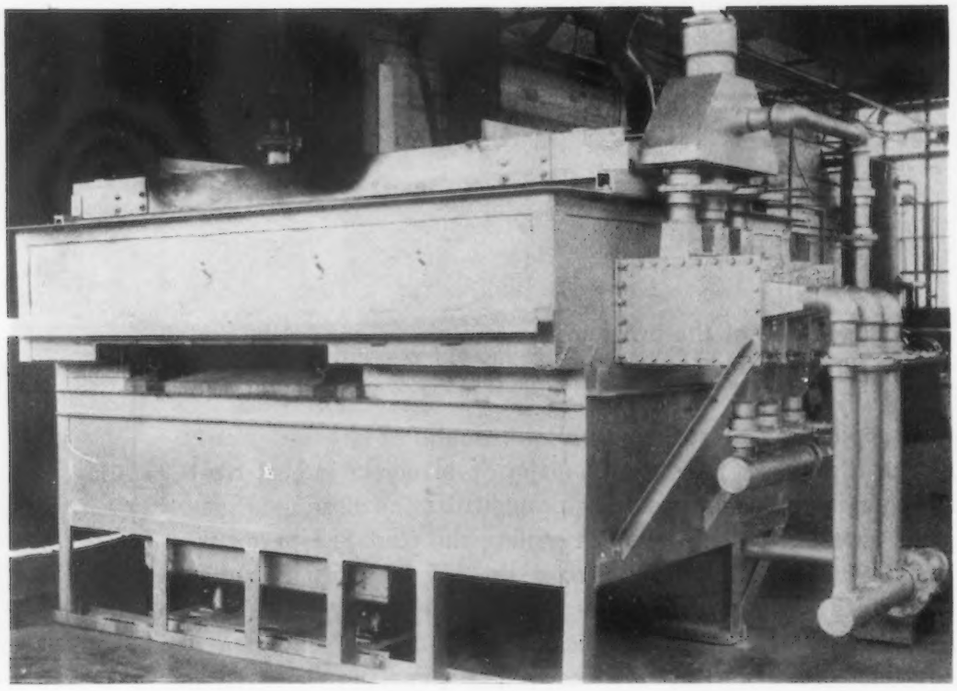
In the electric furnace conditions are different. Except as its atmosphere may be changed by oil on the work or by emission of gases from the work at high temperatures, the electric furnace heats the work in a single fixed atmosphere unless an artificial atmosphere is introduced. In the electric furnace of the metallic resistor type, the furnace chamber normally contains comparatively inactive air and will be oxidizing until the 20 per cent of oxygen in the air has been consumed in burning oil on the work or any other combustible matter present or, in the absence of either, by combination with the surface of the work to form oxide.

If the furnace is air tight or has no great infiltration of air, oxidation stops and heating proceeds in an atmosphere which tends to be neutral or reducing if there was oil on the work when loaded. This situation and the lack of the constant movement of atmosphere which exists in the combustion furnace account for its ability to produce a product with a surface, satisfactory under present standards, in what is apparently an oxidizing atmosphere.

Although control of atmosphere in the electric furnace, beyond the equilibrium normally set up in its operation, must be secured through an artificial atmosphere, the electric furnace is not materially handicapped. Although on some applications the desired results may be secured in the combustion furnace without use of an artificial atmosphere, its results probably cannot be made as positive as would be the case with an artificial atmosphere, due to the numerous variables involved in control of atmosphere through combustion and pressure control. The electric furnace operated with an artificial atmosphere seems to have an advantage over the combustion furnace operated with an artificial atmosphere in the probability of easier application in design and lower maintenance cost.

Metallurgy Complicates Control of Atmosphere

The problem of control of atmosphere becomes complicated with the recollection that, in the case of steel, it is not simply necessary to avoid oxidation



DIFFUSION flame gas-fired forging furnace of the Surface Combustion Co.

THIS 54-kw. continuous-belt electric furnace, (below) designed by the Process Engineering & Equipment Corpn., bright-anneals brass and nickel-silver stampings with atmosphere of hydrogen in heating chamber and nitrogen in cooling chamber.

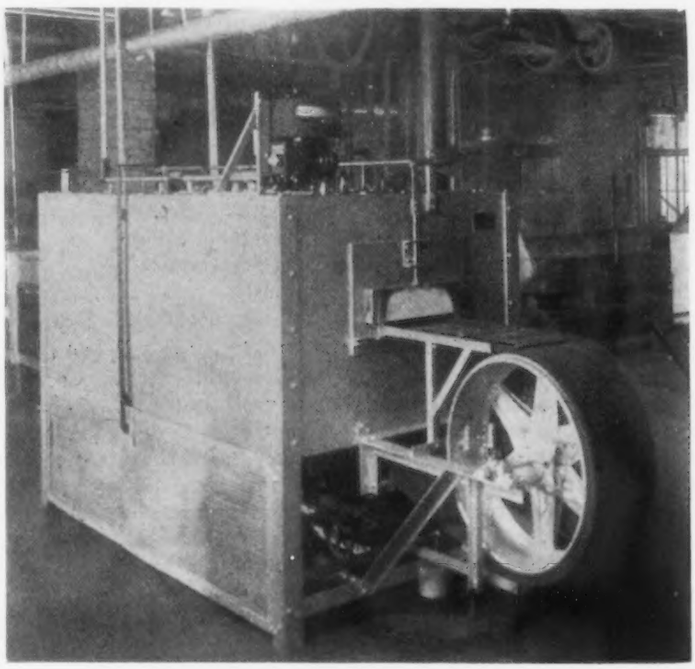
but decarburization and carburization must also be prevented. Scaling takes place in the presence of oxygen, carbon dioxide and water vapor. Decarburization without scaling may result in an atmosphere of dry hydrogen and dry hydrocarbons and, with scaling, from carbon dioxide and wet hydrocarbons. Carburization without scaling may be produced by dry carbon monoxide and dry hydrocarbons and, with scaling, by wet carbon monoxide and wet hydrocarbons. With theoretical combustion of gas, the furnace atmosphere contains carbon dioxide, water vapor and nitrogen so that both scaling and decarburization may result. With excess air combustion, scaling increases and decarburization is reduced. With excess gas, scaling is reduced and carburization increased.

It has been found possible to keep both scaling and decarburization at a minimum by partial combustion, using a large excess of gas with dehydration of both gas and air before they enter the furnace. It is thus apparent that control of furnace atmosphere is a somewhat complicated problem, especially when attempted through combustion control, and that it involves considerable fundamental metallurgy, careful furnace design and skillful operation.

Gas Blanket Eliminates Scale in Forging

Recent extensive research on the fundamentals of heating steel for forging has been applied to a number of large experimental gas-fired forges in which the stock, protected by a layer of raw gas, is heated in an intensely luminous flame resulting from diffusion flame combustion. Oil has always been favored as a fuel for forging because the intense luminosity of its flame, caused by incandescent carbon, results in a rapid transfer of heat to the stock by radiation. In the usual method of combustion of gas, the fuel and air are premixed and burn with an almost total absence of flame, so that heat is transferred mostly by the slower process of convection.

In diffusion flame combustion, air and gas are not premixed but issue from the burner in separate layers with combustion taking place progressively as



air meets unburned gas. As oxygen is not present initially in sufficient quantity, the hydrocarbons of the gas are re-formed into hydrogen and free carbon. The carbon is heated to incandescence by combustion of the surrounding gases and becomes the source of luminosity of the flame. The intensity of luminosity produced in this manner in the gas flame is equal to that of the oil flame.

The fact that, in diffusion flame combustion, air and gas leave the burner in separate layers permits the ready segregation of part of the raw gas as a blanket which protects the stock from the products of combustion. The large experimental forges installed in plant operation are said to heat the stock at the speed of oil forges, and with a total absence of scale. The diffusion flame combustion forge with its highly luminous flame, rapid rate of heating and almost complete control of atmosphere seems to have a wide field of application in the forge shop on the completion of its development.

Artificial Atmospheres for Bright Annealing

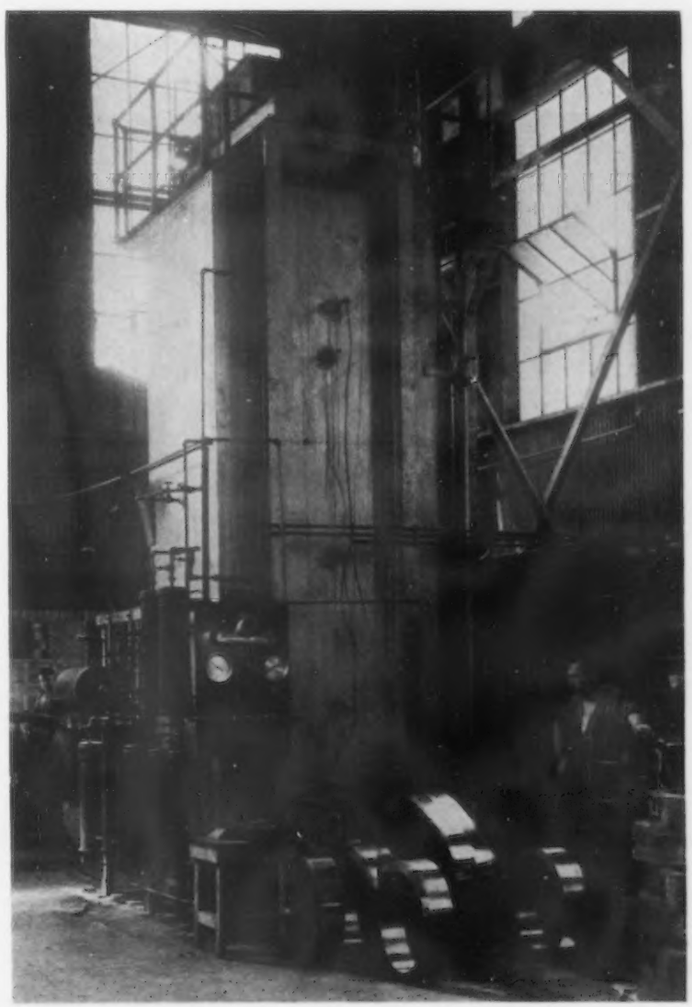
Intensive application of artificial atmospheres, or a combination of artificial atmosphere and the products of combustion, is proceeding rapidly in the annealing of ferrous and non-ferrous metals and alloys. Furnaces of the batch, pusher and continuous types have been built for these bright annealing operations during the past year. One cold-rolled steel plant has 24 electric furnaces of the bell type annealing batches of coiled strip steel. Electric furnaces of the bell type have been built in capacities up to 33 tons per charge.

Other types of batch and continuous furnaces have been designed for the use of electricity, gas or oil. With the exception of bright annealing of cold-rolled strip steel in batches in an atmosphere of producer gas or other gases, most of these bright annealing processes must be considered as being in the early stage of development but with every promise of solution of the problems of atmosphere and construction which may arise as applications of processes extend.

Gases used as atmospheres in connection with bright annealing, either during heating or cooling, include hydrogen, nitrogen, hydrogen-nitrogen mixtures, city gas, natural gas, producer gas, carbon monoxide, carbon dioxide, mixed gas from re-forming of butane, city gas or natural gas or from the dissociation of anhydrous ammonia, and methanol.

Methanol as a Furnace Atmosphere

An interesting recent development has been the experimental application of methanol, CH_3OH, to the bright annealing of clean brass in a gas-fired furnace. Vapors of methanol are added to flue gas from which the moisture has been removed. With brass acting as a catalytic agent, the methanol breaks down into carbon monoxide and hydrogen. In the presence of methanol, the tarnishing which might be expected from the carbon dioxide of the flue gas does not take place. By use of methanol it has been possible to bright anneal clean brass even at some of the lowest temperatures specified, as low as 1000 deg. F. However, the economic development of the process is concerned not only with the cost of methanol but also with the cost of removal of heavy lubricants used in rolling, before annealing, if a bright anneal is to result, and both of these must be balanced against the saving by the elimination of pickling.

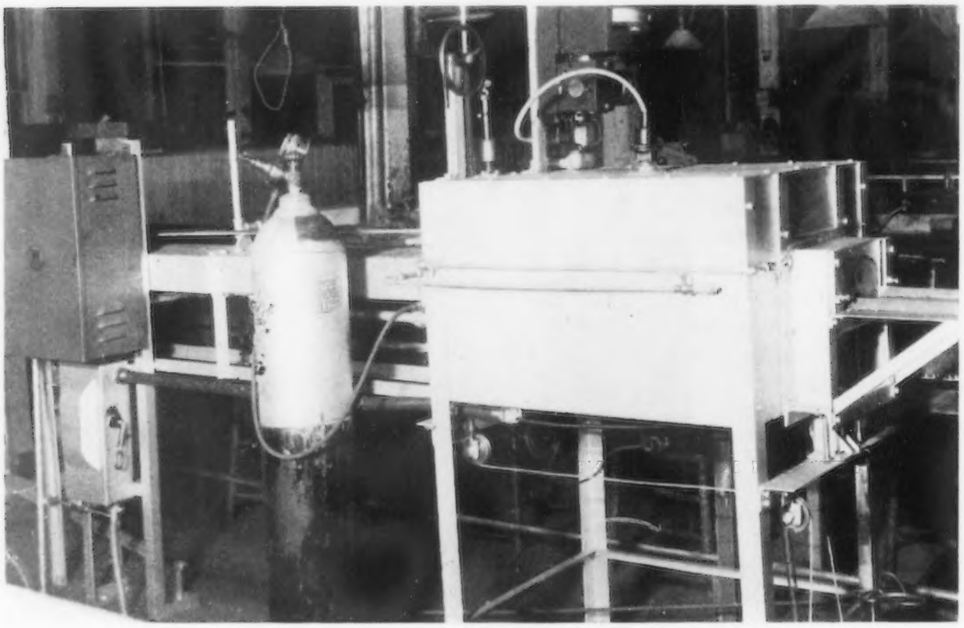


THIS 125-kw. vertical electric furnace of the Gas Equipment Engineering Corpn. bright-anneals cold-rolled carbon steel and rustless steel strip continuously with hydrogen or producer gas atmospheres at Wallingford Steel Co., Wallingford, Conn.

Electric bright annealing furnaces of the pusher and conveyor types, as at present developed, include a heating chamber in which the work is heated to annealing temperature in a suitable artificial atmosphere and a cooling chamber where it is cooled in a suitable atmosphere down to a temperature below that at which the work would oxidize in air. Where

hydrogen is used as the atmosphere, correct furnace design is of great importance in securing economical bright annealing with safety. The design should be such that waste of hydrogen is kept as low as practical. Where air and hydrogen come in contact, they must be ignited before an explosive mixture forms by use of pilots or other means. If hydrogen burns inside of the furnace, provision must be made for removal of moisture.

Doors may be used on pusher furnaces not only on the ends but between the heating and cooling chambers, with the hydrogen of the heating chamber supplying the non-oxidizing atmosphere of the cooling chamber when work is moved from the heating chamber to the cooling chamber. In a conveyor belt furnace of one type, having no doors, hydrogen forms the atmosphere of the heating chamber but nitrogen is used in the cooling chamber. Hydrogen burns at the entrance of the heating chamber, but it has been found advisable to use an inert, non-explosive gas such as nitrogen in the cooling chamber with the outlet open and a low temperature existing. The use of a hydrogen atmosphere in bright annealing with correct furnace design and common sense in operation has apparently resulted in no great explosion hazard.



THIS 7.5-kw. pusher electric furnace, made by the Process Engineering & Equipment Corpn., bright-anneals gold, silver and brass stampings in hydrogen atmosphere at the L. G. Balfour Co., Attleboro, Mass.

Is Control of Atmosphere Economical?

The extent to which control of atmosphere should be applied in the annealing processes of an industrial plant is largely a consideration of the overall cost of the annealing and the subsequent pickling. With the exception of rolling mill brass, most metal and alloy products of the mill will not require washing before bright annealing. If bright annealing eliminates pickling, the cost of pickling must be credited against the cost of bright annealing. If on this basis bright annealing has a cost equal to the cost of oxidizing annealing followed by pickling, serious consideration must be given to its use because of other economies which are:

Elimination of metal loss by oxidation, which may be as high as ½ to 2 per cent.

In many cases a higher grade product is made because, with no pickling, there can be no pitting of the surface.

Higher rate of production and the ability to fill rush orders more quickly.

For some alloys, consideration must be given to the use of non-oxidizing annealing or annealing without scale but without securing a bright surface on the products, so that a weak pickle is required after annealing, because its overall cost might prove to be less than that of bright annealing.

Some Relative Cost Data

The relative costs of oxidizing, non-oxidizing and bright annealing of nickel-silver stampings in pusher-type furnaces of approximately the same size, in one case were as follows:

	Oxidizing, Per Ton	Non-Oxidizing, Per Ton	Bright, Per Ton
Labor	$2.25	$5.00	$2.00
Power	2.90	....	2.90
Acid	2.25	....	....
Fuel oil and acid	....	7.26	....
Hydrogen (pressure tank)	....	....	1.50
	$7.40	$12.26	$6.40

The cost of hydrogen when used in the form of dissociated ammonia or in the form of re-formed hydrocarbon gases is materially lower than the cost of pressure tank hydrogen. Dissociated ammonia hydrogen can be produced in the industrial plant at about one-half the cost of purchased pressure tank hydrogen, and electrolene hydrogen, re-formed hydrocarbon gases, at one-tenth the cost of pressure tank hydrogen. In the bright annealing of steel in

batches, a suitable atmosphere of producer gas can be provided at a cost of 15 to 30c. per ton annealed. On the other hand, the cost of batch pickling of steel forgings varies from $1.25 to $3 per ton.

An encouraging feature of the present work being done on the control of atmosphere in heat-treating furnaces is found in its application with either electricity, gas or oil as the source of heat, and in the number of furnace manufacturers that have completely developed furnace equipment on the market ready for use in some heat-treating process requiring control of atmosphere in the furnace.

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Relief of Internal Stresses in Heat Treatment

AN experimental procedure for observing the rate of decrease of uni-directional stresses during heat treatment has been devised by R. Mailander (*Stahl und Eisen*, May 28, 1931). Test pieces 0.55 in. in diameter and 5.12 in. long, mounted in constant temperature salt baths, were subjected to a series of initial loads. By means of extensometers attached to the specimens, the loads were gradually diminished with time in such a manner that the deformation remained constant.

The observed decrease in load corresponds to relief of stress in heat treatment, due to the conversion of elastic deformations to permanent deformations. This conversion results from the fact that the elastic limit of the steel decreases with rising temperature more rapidly than the modulus of elasticity, so that a given deformation may be elastic at room temperature but yet correspond to a stress greater than the elastic limit when the metal is hot.

Each of the specimens was loaded gradually to determine the deformation-stress curve from which was calculated the initial elastic stress, corresponding to the imposed deformation at the initial load in the constant deformation tests.

Observations of the equalizing load were made at 5 and 10-min. intervals over periods of 15 hr. The results were plotted as residual stress-time curves, there being a family of such curves for each temperature corresponding to the various initial stresses. Steel R (0.35 per cent C, 1.2 per cent Cr, 1.5 per cent Ni) was cut from a large forging which had been heat treated at 840 deg. F. Steel S (0.4 per cent C, 1.5 per cent Cr, 3 per cent Ni) was from a rolled section which had been oil-quenched from 1560 deg. and then drawn for 4 hr. at 1150 deg. The test temperatures ranged from 840 to 1110 deg., but the structural changes in steel R, induced by heating above 840 deg., proved to be negligible in the prolonged tests.

In all cases the stress decreased rapidly for the first 2 hr. and then more gradually, so that at the higher temperatures increasing the time from 10 to 20 hr. had relatively little effect. By interpolation it was possible to construct a second series of curves showing the residual stress corresponding to given initial stresses at given temperatures after given periods of treatment. Above an initial stress, corresponding closely to the yield point at the given temperature as determined in short time tests, the curves became nearly flat, indicating that, whatever the initial stress, the tendency was to leave the same residual stress after treatment at a given temperature for a given time.

It was possible to translate these results into the corresponding stresses at room temperature, since the modulus of elasticity of the two steels was found to vary approximately in the same manner as indicated by the ratios:

$$E_{68}\text{ deg.} : E_{840}\text{ deg.} : E_{930}\text{ deg.} : E_{1020}\text{ deg.} : E_{1110}\text{ deg.} = 100 : 78 : 69 : 58 : 52$$

Extrapolation of the curves to lower initial loads would end at the elastic limit for the existing temperature, because at this point the initial and the residual stress would be the same, although the experimental values are uncertain.

Curves of residual stress against treating temperature showed the same course for both steels. The residual stress decreased rapidly as the temperature was raised from 840 to 950 deg., especially for the higher initial loads, but the effect of increase to 1110 deg. was less marked. Extrapolation showed that even 20-hr. treatment below 570 deg. would not appreciably relieve internal stress in these materials. Some specific examples are given in the following table:

Initial Stress, Lb. per Sq. In.	Temp., Deg. F.	Time, Hours	Final Stress, Lb. per Sq. In.
28,000	930	20	11,000
28,000	1,110	20	6,000
57,000	1,110	20	7,000

The advantage of the method lies in the ability to determine the relation between residual stress and temperature, time and initial stress clearly and rapidly. The results are not directly to be translated from small to large sections; the time element is certainly different. There seems to be no great difference in the results with uni-directional stresses and those obtained by other methods with three-dimensional stresses.

▲ ▲ ▲

"Functions of an Assistant to the President," the thirteenth report in a series of publications on business organization, has been issued by the policyholders' service bureau of the Metropolitan Life Insurance Co., 1 Madison Avenue, New York. By investigation among a number of companies which include in their organizations the position of assistant to the president, the bureau ascertained the functions for which such an official is regularly and exclusively responsible. The report summarizes these duties and describes the manner in which this position is interpreted in individual companies.

FIG. 1.—Copper steel as cast; 100 diameters. Carbon 0.31, manganese 0.71 and copper 0.97 per cent. Fig 2. (Opposite page)—Same steel as Fig. 1, normalized at 1550 deg. F.; 100 diameters.

ONE PER CENT HAS MANY DESIRABLE

By H. B. KINNEAR
Consulting Metallurgist
Marion, Ohio

FROM time to time interesting papers dealing with the alloy steels of the present day and their application to the casting industry have come to the attention of the writer and, in a measure, he has been surprised that in none of these accounts has mention been made of plain copper steels except in the case of the low copper, corrosion-resisting alloy generally spoken of as copper-bearing steel, containing about 0.25 per cent copper and usually found on the market in the form of sheets, either black or galvanized. It has occurred to him, therefore, that it might be of passing interest to review briefly some experiences of the past five years with a cast steel containing 1 per cent copper, the alloy having been added for the express purpose of producing a high elastic, ductile product with no particular attention given to its corrosion-resisting properties.

Some Early Ideas of Copper in Steel

It is the opinion of the writer that this interesting subject would be slighted, were not some accounting given of the vast amount of work done by many prominent investigators who have in the past given much of their time and study to determining the effects of various combinations of copper with iron and steel.

As early as 1627 Lewis Savot had experimented with alloys of copper and iron and reached the conclusion that copper additions made iron brittle and at that time he referred to an earlier investigator, Budelius, who held that copper rendered iron incapable of being welded. In 1800 Rinman tells us that it cannot be denied that copper in iron renders it incurably redshort, and some time later, about 1835, Mushet made a valuable contribution to the art, in that he found that copper alloyed with iron more freely as the carbon decreased.

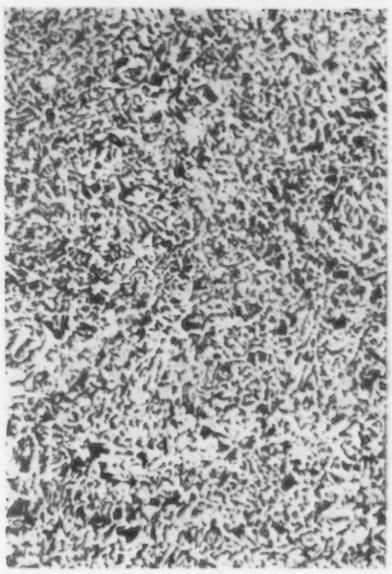
In the same year (1835) Stengel concluded that it took a much smaller percentage of sulphur than of copper to produce redshortness and that 0.10 per cent sulphur was much more injurious than 0.75 per cent or more of copper. Stengel was the first investigator, therefore, to note that sulphur was one of the variables that played an important role in the matter of redshortness. Almost 50 years later, in 1882, Stengel's conclusions were verified by the experiments of Wasum in Germany, who investigated the effects of copper alone, sulphur alone and the two together on steel and found that 0.9 per cent copper did not produce a trace of redshortness and the two together did not produce it unless the sulphur was sufficiently high to produce it on its own account.

These observations were confirmed by the French investigator Choubley, who found that steel containing 1 per cent copper could be rolled without any evidence of redshortness, provided the sulphur content was not excessive. In 1890 Riley observed that aluminum was necessary to make a perfect mixture of copper and iron and in the same year, at the Scranton Steel Works, Bessemer rails containing 0.50 to 0.66 per cent copper were rolled without evidence of redshortness.

No Ill Effects from Certain Copper Contents

A most elaborate and thorough investigation was undertaken in 1901 by J. E. Stead and John Evans in an effort to determine definitely whether or not copper produced redshortness in steel and they con-

COPPER STEEL PHYSICAL QUALITIES



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A STEEL containing about 1 per cent copper has desirable properties after proper heat treatment.

Redshortness can be avoided in such steel if sulphur is kept within safe limits.

There is evidence of precipitation hardening if normalized copper-bearing steel is reheated between 900 and 1050 deg. F.

This type of steel can be produced as castings or as forgings with suitable heat treatment. Copper causes fine-grained structure in gray iron.

Copper alloy steels containing molybdenum, chromium, vanadium and zirconium have good physical properties. Chrome-copper alloy steel is used extensively in structural shapes abroad.

cluded that, between 0.50 and 1.30 per cent, copper had no ill effects upon the hot or cold working of steel and shortly after this in 1907 Pierre Breuil, in France, conducted probably the most exhaustive research on the subject that has ever been undertaken, pointing out that copper in steel lowers the Ar_3 point, greatly intensifies the Ar_1 point, increases the tensile strength, produces a finer grain, and that in shock tests copper steel is the equivalent of nickel steel.

Much was done about this time in the corrosion field and many investigations were undertaken to establish the fact that 0.25 per cent copper added to steel tended to inhibit corrosion. Among the most prominent of these were the experiments of Buck in 1913 and Burgess and Aston about the same time.

As late as 1921 an eminent metallurgist tells us again of copper's ability to produce redshortness, with the limitations, however, that this occurs only over a certain range of temperatures.

From this brief history of the element copper and its relation to iron and steel it is readily seen that many well known metallurgists have long considered its presence in quantities much over 0.50 per cent as undesirable at least, and some have considered it quite detrimental.

Copper Alloy Steel and Gray Iron Castings

About 1925, in spite of all that had been said against it earlier, the writer became very much interested in copper as an alloy for cast steel after having experimented with it in gray iron and noted its effect on closing the grain, in which respect it greatly resembles nickel. Consequently, a little later permission was granted to make a 4-ton basic electric heat of copper steel containing 0.90 per cent copper and pour it into castings and test bars and determine its physical characteristics, proper heat treatment and such other tests as might be required to pass judgment on its fitness for the production of heavy-duty steel castings, such as those used in power shovel construction.

The results of this first trial were so promising that a second heat was made and later a series of heats in which the copper varied from 0.52 per cent to 9.47 per cent. In this latter series all of the bars above 5 per cent copper showed poor ductility, and interest finally centered around the 1 per cent copper range as the most promising field. Much experi-

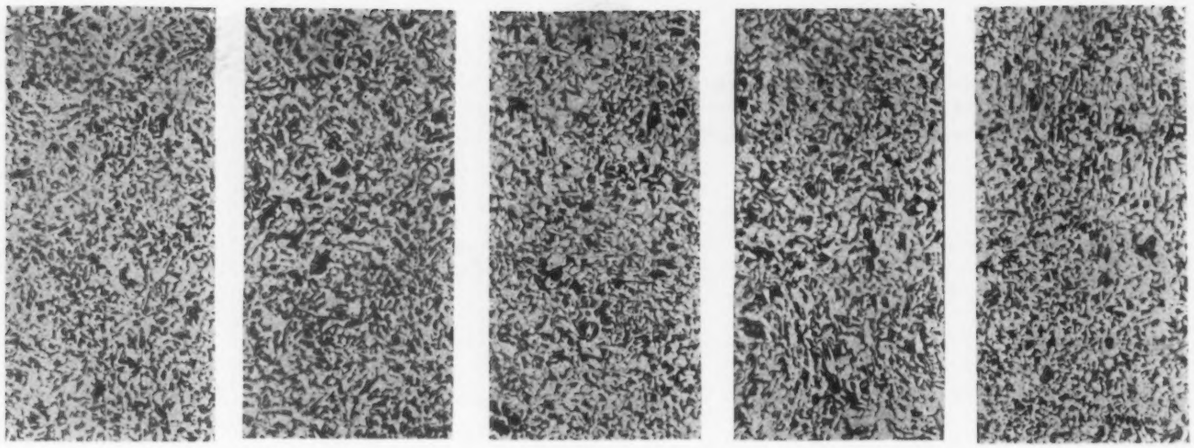


FIG. 3 FIG. 4 FIG. 5 FIG. 6 FIG. 7

FIGS. 3, 4, 5, 6 and 7. (Left to Right)—Same steel as Figs 1 and 2 but drawn at 1000 deg., 1100 deg., 1200 deg., 1250 deg., and 1300 deg. F. respectively. Each one is 100 diameters.

mental work was done before the entire output of the steel foundry was turned over to copper steel in September, 1925, and seven other alloy steels were discontinued. The analysis selected for production and the physical requirements follow:

	Per Cent		
Carbon	0.28-0.34	Yield point (min.),	58,000 lb. per sq. in.
Manganese	0.60-0.70	Ultimate strength (min.),	90,000 lb. per sq. in.
Phosphorus	under 0.05	Elongation (min.),	19 per cent
Sulphur	under 0.035	Reduction of area (min.),	35 per cent
Silicon	0.35-0.45		
Copper	0.85-0.95		

Some Interesting Heat-Treating Results

In the early experiments with this alloy a most interesting characteristic was discovered and one that had not been noted by any previous investigators. It was found on heat treating a series of test bars, having an analysis of 0.35 per cent carbon, 0.68 per cent manganese and 0.90 per cent copper, that, if two bars were heated to 1550 deg. F., cooled in the air to room temperature and one of these bars was machined and pulled in the normalized condition, and the other normalized bar reheated to 1000 deg. F., then cooled in air, machined and pulled, there would be a marked increase or "jump" in the yield point, ultimate strength and Brinell hardness, of the reheated bar, and with carbons around 0.35 to 0.40 per cent an appreciable increase in elongation and reduction of area was to be noted.

However, with low carbons the elongation and reduction did not increase. Here we have then a tempering operation producing the effect of a quenching operation without injuring the ductility of the product and, in the case of the high carbons, really improving it.

This unusual behavior, resulting from a supersaturated solution of copper in iron, resembled very much the precipitation hardening of aluminum-silicon alloys, and undoubtedly it is a further example of this same phenomenon. On cooling a steel alloyed with more than 0.50 per cent copper, there is not sufficient time allowed for the excess copper, or its compounds of silicon and possibly iron, to be precipitated out of solution and, after cooling to room temperature, if this same steel is reheated to a temperature ranging from 850 to 1050 deg. F., depending upon the carbon content, this compound precipitates out as submicroscopic crystals between the glide planes and produces the results pointed out above. It is a significant fact that, whatever the nature of this change may be, it is not revealed by the microscope.

(To be concluded)

Bibliography and Symposium on Copper Alloy Steels

Savot, Louis (1627). *Journal* of Iron and Steel Institute, 1889, Vol. I, page 130. He stated in his book that copper made iron brittle and spoke of the difficulties blacksmiths had in working iron containing copper. He referred to a still earlier authority, Rudelius, who held that copper rendered iron incapable of being welded.

Jars (1774). Voyages Metallurgiques, Lyons 1774, Vol. I, page 4. "It is generally thought that copper is a pest for iron."

Ball and Wingham. *Journal* of Iron and Steel Institute, 1889, Vol. I, page 123. "It is generally thought that copper is a pest for iron."

Rinmann. Percy's Iron and Steel, 1864, page 147. In 1880 Rinmann said that, after heating five parts of iron and one part of copper, while it was hard and tough, it could not be denied that copper in iron renders it incurably redshort.

Faraday and Stodart (1820). *Quarterly Journal of Science, Literature and the Arts.* Vol. IX, page 329. They could not see that 2 per cent of copper in mild steel improved its properties.

Mushet. Phil. Mag., Vol. VI, page 81, 1835. Mushet, in 1835, concluded as a result of his experiments that copper alloyed with iron more freely as the carbon decreased.

Stengel (1837). Karsten's Archiv, Vol. X, page 714, 1837. Stengel states that a much smaller percentage of sulphur than of copper will produce redshortness, and that 0.10 per cent of sulphur is much more injurious to steel than 0.75 per cent or more of copper.

Karsten. *Eisenhütten Kunde,* Vol. I, page 498. "Iron will take up but very small amounts of copper which will make it redshort."

Longmaid. Patent 1863 AD 1861. Longmaid in 1861 took out a patent on copper steel having unusual hardness.

Eggertz (1862). *Jahres Bericht,* Wagner, 1862, page 9. Eggertz found (1862) wrought iron with 0.50 per cent cop-

per showed only slight traces of redshortness.

Percy (1864). Percy's Iron and Steel, First Ed. page 149. Percy concluded from his experiments that copper and iron were miscible in all proportions.

Willis (1880). *Journal* of Iron and Steel Institute, Vol. I, page 93. Willis found that 0.10 per cent copper did not produce an effect on steel.

Wasum (1882). *Stahl und Eisen*, 1887, page 193. Wasum investigated the effects of copper alone, sulphur alone and the two together upon steel and found that 0.90 per cent copper did not produce a trace of redshortness. Copper and sulphur together did not produce it unless the sulphur was sufficiently high to produce it itself and that the limit of sulphur was 0.15 to 0.16 per cent.

Choubley (1884). *Bulletin de la Société de l'Industrie Minerale*, Vol. 13, page 205. *Journal* of Iron and Steel Institute, 1884, Vol. I, page 248. *E. and M. Journal*, 1884, Vol. 38, page 5. Choubley in France confirmed the observations of Wasum on the rolling qualities of copper steel and found that 1 per cent copper without excessive sulphur did not show redshortness.

Holtzer (1889). *E. and M. Journal*, 1890, Vol. I, page 426. Holtzer exhibited some copper steels bearing 3 to 4 per cent copper at the Paris Exposition in 1889 having elastic limits as high as 142,000 lb. per sq. in.

Brustlein (1889). *E. and M. Journal*, 1890, Vol. I, page 426. He said that copper steels with more than 1 per cent copper are decidedly redshort, that copper did make a thorough mixture with steel.

Ball and Wingham (1889). *Journal* of Iron and Steel Institute 1889, Vol. I, page 123. They observed that carbon favored the more intimate mixture of copper and iron, worked well hot or cold and made the steel hard.

Riley (1890). *Journal* of Iron and Steel Institute 1890, Vol. I, page 123. Riley observed that aluminum was necessary to make a perfect mixture of copper and iron.

Schneider (1890). *E. and M. Journal*, 1890, Vol. I, page 426. Schneider patented a method of alloying copper and steel and this steel was used in the manufacture of ordnance. The copper content ranged from 5 to 20 per cent.

Bauerman (1890). Treatise on Metallurgy of Iron, page 50 Ed. 1890. "Copper and iron melt together in all proportions."

Scranton and Garrison. *Journal* Franklin Inst., Aug. 1891, page 125. Scranton and Garrison, Scranton Steel Works, manufactured Bessemer T-rails with 0.50 to 0.66 per cent copper which were not redshort.

Howe (1891). Howe's Metallurgy of Iron and Steel. He agreed that copper and iron unite in all proportions.

Garrison (1891). *Journal* Franklin Institute, August, 1891, page 125. Garrison hopes for extensive use of copper steel in view of high elastic limit and good elongation.

Hogg (1893). *Journal* of Soc. of Chem. Industry, Vol. XII, page 236. *Journal* of Iron and Steel Institute, 1893, Vol. I, page 388. "Copper does not tend to segregate."

Arnold (1894). *Journal* of Iron and Steel Institute, 1894, Vol. I, page 107. Arnold had no difficulty in hammering an ingot having 0.10 per cent carbon and 1.80 per cent copper. He said that copper has a greater influence on raising elasticity than manganese.

Colby (1899). *Journal* of Iron and Steel Institute, 1900, Vol. I, page 412. THE IRON AGE, 1899, Nov. 30, pages 1-7. Colby furnished propeller shafts and gun tubes for United States battleships forged from 0.56 per cent copper steel.

Williams. *E. and M. Journal*, Vol. 70, 1900, page 667. THE IRON AGE, Nov. 29, 1900. Williams noted the influence copper had on the corrosion of steel.

Lipin (1900). *Stahl und Eisen*, Vol. 20, pages 536-541 and 585-590. *Journal* of Iron and Steel Institute, 1900, Vol. II, page 551. This author experimented first with Swedish charcoal pig irons, finding that these irons would take up completely about 5 per cent of copper. The copper additions tended to raise the tensile strength, make the iron more fluid when molten and denser when cast. He next experimented with its influence on malleable iron and steel. While it was formerly believed that small quantities of copper made steel redshort, the results of various experiments varied greatly and in several instances the redshortness was credited to copper when other elements present caused the difficulty. He found steel low in sulphur and containing up to 3 per cent copper and 0.10 per cent carbon could be worked readily, but cracked badly when the copper reached 4.70 per cent. A higher carbon steel (0.42C), he found to roll quite well up to 2 per cent copper when redshortness became apparent, indicating that as the carbon increases the copper content must be diminished.

Ruhfus (1900). *Stahl und Eisen*, Vol. XX, page 691. *Journal* of Iron and Steel Institute, 1900, Vol. II, page 554. The author finds that the maximum permissible percentage of copper that can be present without causing redshortness in rolling is 0.40 per cent for ingot iron and 0.50 per cent for steel containing higher percentages of carbon and manganese; in each case the sulphur and phosphorus not to exceed 0.05 per cent. He explains that his results differ materially from the results obtained by Lipin, due to the fact that in the latter case the steel was made in crucibles and the copper added, as metallic copper, under conditions to exclude oxidation, while in his own case the copper was present in the pig iron used in the production of the steel and might be present in some other form or combined with oxygen, sulphur or some other element.

Stead and Evans. *Journal* of Iron and Steel Institute, 1901, Vol. I, page 89. After reviewing the work of many experimenters and noting that many could not agree on the phenomenon of redshortness, between 0.50 and 2 per cent copper, the authors decided to run a series of experiments on Bessemer rail steels having 0.50, 0.90, 1.30 and 2 per cent copper and one open-hearth heat having 0.50 per cent copper. Steel of the same composition without the copper was rolled along with the copper-bearing steels and in each case the copper steel rolled as perfectly as those without it, except the 2 per cent copper ingot, which was torn on the flanges. However, an examination showed that this ingot had been over-heated, which would indicate that high-copper steels cannot be heated so high. In the case of the open-hearth ingots containing 0.50 per cent copper, each ingot of the non-cuprous part of the heat cracked in rolling while the copper ingots rolled without a flaw.

Stead and Wigham. *Journal* of Iron and Steel Institute, 1901, Vol. II, page 122. They experimented with copper in steel for wire making and found 1.28 per cent copper was not detrimental when carbon was low. They found also that it inhibited corrosion.

Stead (1901). *Journal* of Iron and Steel Institute, 1901, Vol. II, page 104. He found that the amount of carbon present determined the percentage of copper that can be alloyed with the iron. He also noted that copper retards corrosion.

Wigham (1906). *Journal* of Iron and Steel Institute, 1906, Vol. I, page 222. "0.60 per cent copper is the limit for copper steel wire."

Pfeiffer (1906). *Metallurgie*, Vol. III, pages 281-287. *Journal of* Iron and Steel Institute, 1906, Vol. IV, page 908.

Dillner (1906). *Stahl und Eisen*, December, 1906. Dillner, Germany, found that 1 per cent carbon and 3 per cent copper could not be rolled.

(To be concluded)

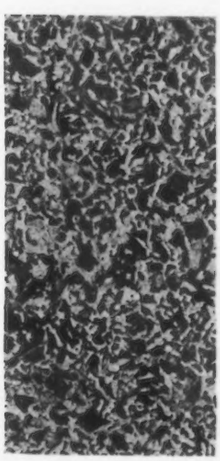
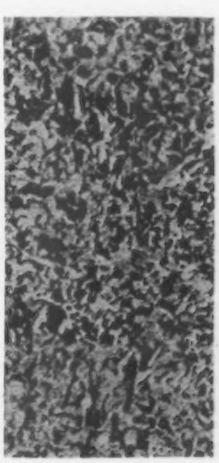


FIG. 8. (left)—A copper steel containing 0.52 per cent copper with carbon 0.41 and manganese 0.65 per cent, normalized at 1550 deg. F.; 100 diameters.

* * *

FIG. 9.—A copper steel containing 0.76 per cent copper with carbon 0.32 and manganese 0.74 per cent, normalized at 1550 deg. F.; 100 diameters.



Planning for Business Revival

By CHARLES A. CARPENTER*

GOVERNMENTS exist for the well being of civilized States. Police and fire protection, mail service, armies and navies, courts, and the other many phases of modern government are but devices to enhance the safety, prosperity and enjoyment of the public.

We have recently become aware of another factor that presses for conquest. Depressions, coming as the aftermath of economic folly, take a toll that cannot be accurately gaged.

Industry has done much for the masses. The average family has more creature comfort than in any previous age of history. However, the employed must look to steady wages in order to derive their just benefits from the rapidly increasing production of innumerable commodities.

If the automobile industry expects to sell millions of cars, its owners must interest themselves in efforts to get millions of workers so employed that they can buy cars. The radio manufacturers cannot expect a rush of orders on any sane credit basis from unemployed who are at the mercy of charity for a bare existence.

Reliance upon government projects whether national or local is likely to be both disappointing and disastrous. It is more American, safer politically and better for the morals of the people, to seek a more direct solution. The question to answer is how to create jobs not for a few thousands, but for millions of wholly or partially unemployed.

Replace Dilapidated Public Buildings

Look around. Can you find a prison that may be a fire trap like the one that burned in Columbus? Does your town have a home for the aged that may be a death chamber such as the one that recently burned in Pittsburgh?

Can you think of disgraceful shacks rented to the unfortunate at outrageous rents yet violating common sense ideas of sanitation and safety? Are the private institutions in your town safe, sanitary, properly equipped? Is your Alma Mater well housed?

There are so many thousands of things to do, it is almost criminal to let our great people fall into beliefs such as shorter work days, a five-day week, bolshevism or other panaceas.

Until every squalid tenement is replaced by a decent dwelling place, until every institution housing the sick, unfortunate or aged, is safe and sanitary, until every child in America has a fair start in life, until every effort has been made to alleviate misery and suffering, there is work to do.

What is the dam that holds back the flow of money, to get these thousands of projects under way? It is lack of leadership. Surely in a land that gave us a Washington, a Lincoln and thousands of idealistic leaders, we have men and women who can lead us now. We can refute the fallacies that the country is overbuilt or that we have overproduction. We can show our independence from the rest of the world. The work is right here before us, enough to keep all of us extremely busy for years and years to come.

Organize Locally for Releases of Credit

Must we ask the Federal Government to struggle along by appropriations of Congress or can we, as a people, organize committees of average citizens, willing to work, who will consult local bankers, people of wealth, religious orders, colleges, etc., in a great big effort to pry loose the dam holding back credit so that the many projects that ought to be started can be launched immediately?

Many large funds of money have been raised or set aside for big projects. Some are held up because the amount raised is not quite enough. A relatively small contribution or a more liberal credit policy would release these jobs. Others are delayed by minor, legal or technical obstacles. These matters could be adjusted. A sane stimulus to business enabling the unemployed to go back to work would immediately help the railroads and all the basic activities of our national life.

Must Seek a Domestic Solution First

Restoration of property value is imperative in order to bring about a return of prosperity. All classes of society are affected by depressions. Therefore, all the people should interest themselves in ways and means to solve the problem.

AROUSE all the people and something will be done about providing work for the idle. This in a word is the underlying idea of Mr. Carpenter's program. Many public buildings, factories and habitations may well be rebuilt, rehabilitated or repaired in the interest of safety, sanitation, comfort and efficency. Let the nation be stirred as it is in war and everybody will feel the obligation.

Prime requisites of national prosperity are solidarity of opinion, leadership, morale, resources and willingness to work. It is a time for generosity, not selfishness.

Tariff or no tariff, exporting or no exporting, we can do more constructive good to the world by bringing back domestic prosperity than in any other way. It is absolutely self-evident that we must seek a domestic solution to our present problem and to similar problems for years to come.

Naturally, a large scale national solution is highly desirable but every institution, every country hamlet, each church, fraternal orders, chambers of commerce and the States can start today to plan for the rehabilitation of their sections of the country. The American way to do things is to place responsibility on local self-government and individual initiative. Let us save ourselves from the dole or a paternalistic central government.

If our conception of democratic self-government is to survive, it is necessary to inspire our people to sacrificial patriotic service now. This is not your job only, it is my job, our job. Everybody must be impressed with the seriousness of the situation.

Just as soon as a real solution of this depression is under way, stocks will go up, real estate values will improve, employment will have increased, commodity values will rise and the depression of 1929-1931 will fade into history as one of our great readjustments for follies perpetrated between 1923 and 1929.

The most tangible way to resume work is to organize volunteer committees in every community grouped to come under a central leadership.

While some things must be financed by public funds received from taxes or bond issues, private funds must be tapped for the bulk of the work. Realization that the bonanza days of interest rates are over should prompt a flow of capital to worth-while ven-

*Special equipment, Park Building, Pittsburgh.

tures for the general good of the public.

The second move is to get something definite started. Public expenditure is helpful at this point.

Thirdly, we can demand enforcement of sanitation, safety, regulations and building codes.

Fourth, the churches might profitably carry on surveys of their congregations in order to get work for their unemployed members or neighbors. This is a good time for practical Christianity. Fraternal orders and similar bodies could find plenty of work eliminating fire-trap institutions, rundown meeting halls, etc.

Some Form of Government Loan Agency

Rather than to lean entirely on public expenditure or upon philanthropy, it would be conducive to high public morale to create some form of Government loan agency that could release credit to worthy welfare projects, enabling construction work to start before all pledges are received. Perhaps courageous bankers would help such a program.

Every agency that can influence expenditure of money for worth-while projects should be enlisted in the greatest volunteer public committee ever contemplated. No news would be quite as encouraging to a disheartened public as word that billions of dollars of work was in sight. The financial support can be obtained through philanthropy, bank credit, governmental and community loans and by taxation.

Wealth is created by work and by work alone can a people continue prosperous. All we need is a real plan gigantic in scope, pushed by publicity and backed by national solidarity.

▲ ▲ ▲

Photo-Electric Relay Operates Shear Cutting Hot Bars to Length

ONE of the new uses of the photo-electric relay is to be found at the Lebanon, Pa., plant of the Bethlehem Steel Co. Here the device is used in the process of cutting hot bars to hot-bed lengths of approximately 150 ft. as the bar passes from the last stand of rolls to the hot bed. The desirable features of this device, as contrasted with the mechanical flag switch, are that it is more readily adjustable along the hot run-out conveyor to obtain accurate lengths of bars sheared for the hot bed; and that the time element between the arrival of the bar at the photo-electric tube and the operation of the Rendleman shear is more constant than in the case of the mechanical flag.

Use of an adjustable time relay was first considered, to provide intermediate rod lengths. But as it was necessary to provide for lengths increasing by increments of 6 in., and as the rod may travel at a maximum speed of 1200 ft. a min., this meant a relay with a minimum time of 1/40 sec. and adjustable in similar increments.

By the use of the General Electric photo-electric relay it was found the equipment could be made to operate satisfactorily. When the front end of the hot bar passes beneath the photo-electric tube, there is enough light emitted from the bar to increase the current flowing through the tube and thus actuate the relay. The tube is mounted above the run-out table at any predetermined point suitable for causing a cut of the proper length. It is easily movable along the table to provide for different lengths.

Change in current in the photo-electric tube is amplified by a Pliotron tube mounted in the relay box some distance away. The amplified current energizes a sensitive relay in the box, which causes two magnetic contactors to close. One of these operates the solenoid which throws the trough of the Rendleman flying shears and cuts the bar to the length desired. The other contactor energizes the a.c. coil of an induction-type time element overload relay.

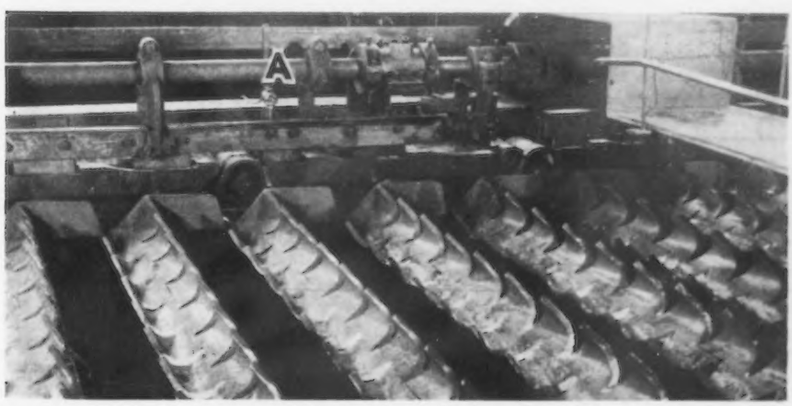
After a predetermined time, which may be adjusted to suit the requirements, the induction-type overload relay closes a 220-volt d.c. circuit which operates another magnetic contactor. This contactor controls the circuit to the magnetic clutch which engages the kick-off motor. Limit switches on the kick-off mechanism start the bed-rocking mechanism, stop the kick-off mechanism after it has completed the cycle and provide interlocks as heretofore. The object of the induction-type overload relay is to provide the necessary interval of time between the shearing and kick-off to allow the bar to reach the proper position in the hot-bed run-out trough before being ejected upon the bed.

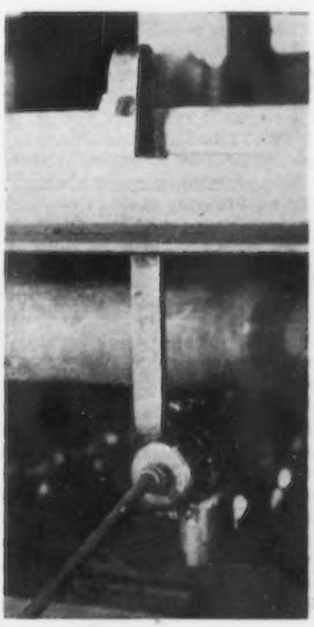
▲ ▲ ▲

Delton Bridge, Sauk County, Wis., constructed by the Lakeside Bridge & Steel Co. from plans by the Wisconsin State Highway Commission, was decorated Aug. 21 by the American Institute of Steel Construction with bronze plaques as the most beautiful small steel bridge erected during the past year.

▲ ▲ ▲

IN the general view the photo-electric tube is at A. It may be moved along the measuring bar to any desired position—the detail (at right) shows how it is clamped to the bar by set-screw. The racking hot-bed sections in the general view carry the cut bars forward to loading cradle.





Quenching Tests on Steels

New Model of Rockwell Dilatometer Reveals Striking Phenomena

A NUMBER of valuable contributions to metallurgy and heat treatment have come as a result of the study and investigations of Stanley P. Rockwell, president, Stanley P. Rockwell Co., Hartford, Conn. Prominent among these are the Rockwell hardness tester, which has come into wide use in this country and abroad, followed later by the dilatometer, an apparatus for determining the critical temperatures in the heat treatment of steels, both plain and alloy.

As a result of further study, Mr. Rockwell announces the perfection of an improved model of his dilatometer, together with further uses to which this new model can be put.

Preliminary Phenomena

In the preliminary work leading up to the perfection of the new model, "L B," Mr. Rockwell obtained some striking results on plain carbon steels which show primarily two phenomena on quenching steel:

> First, if the steel is heated rapidly to a rather elevated temperature, it contracts to about 200 deg. F., expands very violently to water temperature, and then for 6 or 7 min. keeps on expanding at a very slow rate. These tests were on specimens 2¾ in. long and 1 in. in diameter.
>
> Second, if the specimen is heated slowly, about three times more slowly than the fast heating rate, it contracts to about 200 deg. F., then abruptly contracts less rapidly to about water temperature, and for about 3 min. contracts very slowly before coming to equilibrium.

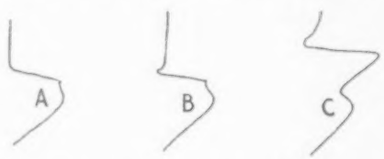
It has been possible to find a happy medium of heating rate and temperature which allows the steel to contract rapidly to about 200 deg. F., and then cease all motion. It has not yet been possible to exactly locate this rate and temperature, but it would appear, on the face of it, as if an explanation is possible as to why steel in one case is of less volume than in another case, because conditions can be duplicated.

Mr. Rockwell reports that the equipment is excellent for studying quenching rates of liquids, as it seems to give a greater insight into the quenching curves than has been possible to secure by pyrometric means. The new model was shown recently to a party of about 20 heat treaters and metallurgists from the Hartford district and great interest was manifested. A complete apparatus has been prepared for exhibition at the National Metal Exhibition in Boston, Sept. 21 to 25.

In further explanation of the perfection of the new Rockwell dilatometer, Mr. Rockwell has furnished the following general statements.

Little has been known as to what takes place in size change of metal during the quenching process, which to steel imparts hardness. Temperature tests have been conducted by inserting a thermocouple into the part quenched and noting the temperature changes. This method of testing has given but meager information, as the existing recording pyrometer is not of a sufficient degree of sensitivity to record the minute temperature changes which may occur in fractions of a second. These tests have disclosed nothing as regards size changes.

Dilatometry, being a mechanical equivalent of temperature, records the manifestations of temperature by dilation to a greatly magnified degree. The desirability of knowing what is



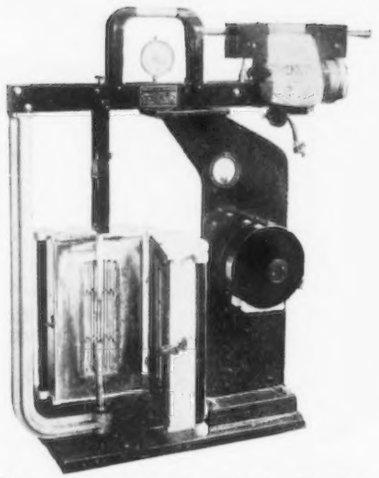
The dilatometric curves of the three types of steels.

taking place concerning size change is apparent when we have known that:

> Metals are often oversize or undersize after the quench as compared to their size before quenching.
>
> Metals vary in hardness due to heating rates and temperatures from which they are quenched.
>
> Metals crack in quenching, the exact time of this occurrence heretofore not being known.

The new Rockwell dilatometer answers and explains these points, he states, and also throws light on many other puzzling functions of cooling steel not previously observed. It is made principally of aluminum, requires no special form or shape of test piece, except that, when temperatures are desired, a ⅛-in. hole must be drilled into the specimen. A quartz tube supports the work and another quartz tube, adjustable and holding a thermocouple, contacts with the top of the sample to be tested. This upper quartz tube is connected to a dial and a gear-driven recorder. The dial is to note minute dilatometric changes down to 0.00005 in. The recorder, whose drum is driven by a Telechron motor, records the time-dilation curve.

The furnace for heating has a working diameter of 3 in. and a length of 12 in. It is of the split type, so that at any instant of heating, or when it is desired to quench the work,



BY means of the handle at the top, the aluminum frame of the new model, L B, can be lifted for transporting the specimen to the quenching medium.

it may be opened. The dilatometer as a whole with its sample is then lifted to the quenching bath, consisting of any medium desired, and the sample quenched.

When higher temperatures are desired for quenching tests than can be secured by the electric furnace, the sample may be heated in any furnace and then transferred to the dilatometer and quenched. The portability of the dilatometer makes such tests practical.

Besides quenching tests the dilatometer is used for critical temperature and coefficient of expansion determinations, as in previous models. The scope of experimental work and the materials, i. e., ferrous, non-ferrous, ceramics, etc., that can be tested are endless.

Steels and Heat Treatment Studied

A few tests with common steels are here cited. The steels used were as follows:

Mark	Carbon, Per Cent	Manganese, Per Cent	Silicon, Per Cent	Chromium, Per Cent	Molybdenum, Per Cent	Tungsten, Per Cent
1	0.40	0.65	low	0.95	0.20	...
2	0.95	1.25	low	0.50	...	0.50
3	1.20	0.25	low	...	...	...
4	1.20	0.25	0.50	0.25	...	...
7	1.05	0.30	low	...	...	...
8	0.95	1.50	low	...	...	...
9	2.25	0.40	low	12.00	...	...

Heating tests to determine characteristics conducted:

1—Heating from cold furnace to Ac_3.

2—Heating from cold furnace to above Ac_3.

3—Heating in hot furnace to Ac_3 and quenching.

4—Heating in hot furnace to above Ac_3 and quenching.

5—Heating in a large gas furnace at a rapid rate to Ac_3, then transferring to the dilatometer and quenching.

6—Heating in a large gas furnace at a rapid rate to above Ac_3, then

transferring to the dilatometer and quenching.

A Few Observations

A few of the observations which may be made on this new application of the dilatometer follow:

1—Considering that of the steels used there are three types, (a) straight carbon water-quenching, (b) non-deforming oil-quenching, and (c) high-carbon high-chrome, it will be noticed that under customary hardening procedure three distinct types of curves are found as illustrated on the opposite page.

2—Oil-quenching steels contract more between Ac_1 and Ac_3, and Ar_3 and Ar_1, than water-quenching steels.

3—Oil-quenching steels take a longer time to complete their transformation than water-quenching steels.

4—Non-deforming steels go through more size change during heating and quenching than do the water-quenching steels.

5—Two steels of different manufacture but of the same chemical analysis and same annealed microstructure may show quenching curves of entirely different characteristics as relates to the hardening points and final dimensions as compared with the original dimensions.

6—It appears to be possible to find for any steel a temperature, a time of soak, and a heating rate which will control the final dimension as related to the original dimension.

7—The actual hardening process is of considerable duration of time, from two to ten times the time it takes to cool the steel down to a temperature which can be borne by the hands.

8—Interrupted quenching, such as removing from the quench say at 800 deg. F., apparently does not alter the final physical conditions, but gives surprisingly different quenching curves.

▲ ▲ ▲

Chicago Bridge & Iron Works, Chicago, has issued an elaborate book containing 152 full-page reproductions of designs submitted in a recent competition, sponsored by the company, to develop esthetic improvement in the character of elevated steel water tanks and their supporting structures. In a foreword, it is stated that a great majority of the designs submitted can be utilized, many at no great additional expense over standard designs.

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The Lake Superior Iron Ore Association, Cleveland under date of August, 1931, has issued its directory of mine operations and statistical data entitled "Lake Superior Iron Ores." It contains 21 pages.

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"Special Refractories for Use at High Temperatures" is the title of research paper No. 327 of the United States Bureau of Standards. The authors are William H. Swanger and Frank R. Caldwell of the bureau.

NATIONAL METAL EXPOSITION'S LIST OF EXHIBITORS

Achorn Steel Co., Boston. Booth C-321.
Air Reduction Sales Co., New York. Booths A-109, 111, 115, 117.
Ajax Electrothermic Corpn., Trenton, N. J. Booth B-269.
Allegheny Steel Co., Brackenridge, Pa. Booths A-2 and B-31.
American Brass Co., Waterbury, Conn. Booth C-131.
American Car & Foundry Co., New York. Booth A-225.
American Cyanamid Co., New York. Booth B-28.
American Electric Furnace Co., Boston. Booths C-302-304 and X-11.
American Gas Association, New York. Booth, Gas Section.
American Gas Furnace Co., Elizabeth, N. J. Booth, Gas Section.
American Instrument Co., Washington, D. C. Booth A-16.
American Manganese Steel Co., Chicago Heights, Ill. Booth A-22.
American Metal Market, New York. Booth D-83.
American Steel & Wire Co., Chicago. Booth B-119.
F. C. Andresen & Associates, Inc., Pittsburgh. Booth B-258a.
Armstrong-Blum Mfg. Co., Chicago. Booth B-266.
Armstrong Cork & Insulation Co., Lancaster, Pa. Booth B-256.
Associated Alloy Steel Co., Inc., Cleveland. Booth B-51.
E. C. Atkins & Co., Indianapolis. Booth A-229.
Automatic Temperature Control Co., Inc., Philadelphia. Booth B-258.
Baldwin Southwark Corpn., Philadelphia. Booth B-47.
Bastian-Blessing Co., Chicago. Booth C-144.
Bausch & Lomb Optical Co., Rochester, N. Y. Booths C-69 and C-71.
Bethlehem Steel Co., Bethlehem, Pa. Booths B-39, 41.
Biax Flexible Shaft Co., Inc., Long Island City, N. Y. Booth B-275.
Botfield Refractories Co., Philadelphia. Booth B-260.
H. A. Brassert & Co., Chicago. Booth D-158.
Bristol Co., Waterbury, Conn. Booths B-32 and C-61.
Brown Instrument Co., Philadelphia. Booths D-76 and D-78.
Brown Wales Co., Boston. Booth A-23.
Carboloy Co., Inc., Detroit. Booth C-136.
Carborundum Co., Niagara Falls, N. Y. Booth B-263, 265.
Carborundum Co., Perth Amboy, N. J. Booth B-263.
Carpenter Steel Co., Reading, Pa. Booth C-58.
Chemical Catalog Co., Inc., New York. Booth A-1.
Chicago Steel Foundry Co., Chicago. Booth D-85.
Climax Molybdenum Co., New York. Booth B-44.
Cling-Surface Co., Buffalo. Booth C-62.
Crucible Steel Co. of America, New York. Booths B-38, 40.
D. A. Stuart & Co., Chicago. Booth A-216.
Dearborn Chemical Co., Chicago. Booth C-300.
Dow Chemical Co., Midland, Mich. Booth D-94.
Driver-Harris Co., Harrison, N. J. Booths B-48 and C-75.
Eisler Electric Corpn., Newark, N. J. Booth C-140.
E. Leitz, Inc., New York. Booths D-80 and D-82.
Electro Metallurgical Sales Corpn., New York. Booth B-45.
Elkon, Inc. (Division of P. R. Mallory & Co.), Indianapolis. Booth B-118.
Endicott Forging & Mfg. Co., Inc., Endicott, N. Y. Booth C-73.
Ensign-Reynolds. Booth, Gas Section.
R. Y. Ferner Co., Washington. Booth A-226.
A. Finkl & Sons Co., Chicago. Booth A-10.
J. B. Ford Co., Wyandotte, Mich. Booth A-222.
Gathmann Engineering Co., Baltimore. Booth D-91.
General Alloys Co., Boston and Champaign, Ill. Booths B-26 and C-55.
General Electric Co., Schenectady. Booths B-126 and C-139.
General Electric X-Ray Corpn., Chicago. Booth C-63.
General Welding & Equipment Co., Boston. Booths C-146 and C-148.
Nathan Mfg. Co., New York. Booth A-228.
Globar Corpn., Niagara Falls, N. Y. Booths B-263, 265.
Halcomb Steel Co., Syracuse, N. Y. Booth C-65.
C. I. Hayes, Inc., Providence, R. I. Booth C-319.
Haynes Stellite Co., Kokomo, Ind. Booth C-138.
R. M. Henshaw & Co., Boston. Booth, Gas Section.
Heppenstall Co., Pittsburgh. Booth B-46.
Hevi-Duty Electric Co., Milwaukee. Booth B-264.
Hollup Corpn., Chicago, Brooklyn. Booth C-142.
Charles A. Hones, Inc., Baldwin, Long Island, N. Y. Booth, Gas Section.
E. F. Houghton & Co., Philadelphia. Booth A-14.
Illinois Steel Co., Chicago. Booths C-52 and D-79.
Illinois Testing Laboratories, Inc., Chicago. Booth C-57.
Illinois Tool Works, Chicago. Booth B-277.
Industrial Welded Alloys, Inc., Newark, N. J. Booth B-262.
International Nickel Co., Inc., New York. Booth D-87.
The Iron Age, New York. Booth A-9.
Ivins' Steel Tube Works, Inc., Ellwood, Oak Lane, Philadelphia. Booth D-86.
Jessop Steel Co., Washington, Pa. Booth A-21.

Jones & Laughlin Steel Corpn., Pittsburgh. Booths C-54 and D-81.
Kelley-Koett Mfg. Co., Inc., Covington, Ky. Booth A-3.
C. M. Kemp Mfg. Co., Baltimore. Booth Gas Section.
Charles Kleist & Son., Jamestown, N. Y. Booth D-90.
Leeds & Northrup Co., Philadelphia. Booths A-221 and A-223.
Lincoln Electric Co., Cleveland. Booths D-154, 156.
Linde Air Products Co., New York. Booths D-149, 151, 153.
Ludlum Steel Co., Dunkirk and Watervliet, N. Y. Booth B-49.
Madison-Kipp Corpn., Madison, Wis. Booth A-233.
Paul Maehler Co., Chicago. Booth, Gas Section.
Magnetic Analysis Corpn., Long Island City, N. Y. Booth D-92.
Mahr Mfg. Co., Minneapolis. Booth C-311.
P. F. McDonald & Co., Boston. Booth D-88.
Metal & Thermit Corpn., New York. Booth C-133.
Michiana Products Corpn., Chrobaltic Division, Michigan City, Ind. Booth A-5.
Midvale Co., Nicetown, Philadelphia. Booths A-4 and B-33.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. Booth A-220.
Molybdenum Corpn., of America, Pittsburgh. Booth D-89.
Morse Twist Drill & Machine Co., New Bedford, Mass. Booth A-19.
National Electric Light Association, New York. Booths C-306, 308, 310.
New England Gas Association, Boston. Booth, Gas Section.
New England Metallurgical Corpn., South Boston, Mass. Booth B-42.
New Jersey Zinc Co., New York. Booths C-50 and D-77.
Newton Die Casting Corpn., New Haven, Conn. Booth D-74.
Nicholson File Co., Providence, R. I. Booth B-268.
Nitralloy Corpn., New York. Booth A-18.
Northwestern Mfg. Co., Milwaukee. Booth B-122.
Norton Co., Worcester, Mass. Booths C-315, 317.
Ohio Steel Foundry Co., Springfield, Ohio. Booth A-12.
Tinius Olsen Testing Machine Co., Philadelphia. Booth C-72.
Page Steel & Wire Co., New York. Booth C-141.
Parker-Kalon Corpn., New York. Booth A-224.
Henry Pels & Co., Inc., New York. Booths C-322, 324.
Permutit Co., New York. Booth A-218.
Pressed Steel Co., Wilkes-Barre, Pa. Booth C-64.
Process Engineering & Equipment Corpn., Attleboro, Mass. Booth C-309.
Production Machine Co., Greenfield, Mass. Booth B-34.
Pyrometer Instrument Co., New York. Booth A-237a.
N. Ransohoff, Inc., Cincinnati. Booth A-237.
Reeves Pulley Co., Columbus, Ind. Booth B-270.
Republic Steel Corpn., Youngstown. Booths A-6-8; B-35-37.
Riehle Brothers Testing Machine Co., Philadelphia. Booth B-36.
Stanley P. Rockwell Co., Hartford, Conn. Booths C-312, 314.
John A. Roebling's Sons Co., Trenton, N. J. Booth A-103.
Roessler & Hasslacher Chemical Co., Inc., New York. Booth C-66.
Ryan, Scully & Co., Philadelphia. Booth C-325.
Joseph T. Ryerson & Son, Inc., Cambridge, Mass. Booth A-27.
Safety Gas Lighter Co., Lynn, Mass. Booth C-152.
George Scherr Co., New York. Booth C-70.
Selas Co., Philadelphia. Booth, Gas Section.
Sentry Co., Taunton, Mass. Booth B-267.
Shakeproof Lock Washer Co., Chicago. Booth B-277.
David H. Smith & Sons, Inc., Brooklyn. Booth A-235.
Smith Welding Equipment Eastern Corpn., Philadelphia. Booth B-120.
Spencer Turbine Co., Hartford, Conn. Booth A-230.
Steel Publications, Inc., Pittsburgh. Booth D-84.
Superior Steel Corpn., Pittsburgh. Booth A-15.
Surface Combustion Corpn., Toledo, Ohio. Booth, Gas Section.
Testing Machines, Inc., New York. Booth A-11.
Timken Steel & Tube Co., Canton, Ohio. Booth B-53.
Una Welding & Bonding Co., Cleveland. Booth C-135.
Union Drawn Steel Co., Beaver Falls, Pa. Booth D-90.
Vanadium Corpn. of America, New York. Booth A-24.
Welding Engineer, Chicago. Booth A-105.
Wetherell Brothers Co., Cambridge, Mass. Both B-271.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass. Booths B-30 and C-59.
Whitman & Barnes, Inc., Detroit. Booth B-273.
Wickwire Spencer Steel Co., New York. Booth C-298.
Wilson-Maeulen Co., Inc., New York. Booth A-227.
Carl Zeiss, Inc., New York. Booth A-7.
L. E. Zurbach Steel Co., Cambridge, Mass. Booth A-17.

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Malleable Iron Corrosion and Embrittlement

Considerable interest has been aroused in the corrosion-resisting properties of malleable iron, especially for overhead trolley construction. Committee A-7 on malleable castings of the American Society for Testing Materials has a subcommittee working on this problem.

The chairman of committee A-7, W. P. Putnam, president, Detroit Testing Laboratory, has been authorized to initiate an investigation of the embrittlement of malleable iron castings which are used in the galvanizing process. A subcommittee will probably be formed to make a critical study of this phenomenon.

Specifications for cupola malleable iron are under development by the committee and a revision is contemplated of the specifications for malleable castings to meet higher strength requirements, particularly for railroad work.

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Sharp Shrinkage in Pig Iron Imports

Imports of pig iron into the United States in July are reported by the Department of Commerce at 6148 gross tons, of which 87 per cent came from British India. The reduction from the June incoming movement was more than one-third and a similar decline was registered against the 1930 July tonnage. Except for last February, the July imports made the smallest total since July, 1928. With that further exception and also that of February, 1927, the tonnage was the smallest for any month since June, 1922.

In the seven-month period 61,971 tons came in. This is only 15 per cent below the 1930 movement in seven months. British India furnished approximately 80 per cent of the total this year against 73 per cent last year. Netherlands was in second position this year, but last year supplied a smaller tonnage than that from the United Kingdom.

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Tonnage rates for boilers and muck mill hands in Midwestern bar iron mills subscribing to the sliding scale wage agreement of the Amalgamated Association of Iron, Steel and Tin Workers continue unchanged for September-October from the rate which has applied throughout the year. Examination of sales sheets revealed an average selling price of $1.70 per 100 lb. on bar iron shipped during the 60 days ended Aug. 20. On this basis, the puddling rate is $10.30, comparing with $10.80 for the corresponding 1930 period.

United States Imports of Pig Iron by Countries of Shipment
(In Gross Tons)

	July		Seven Months Ended July	
	1931	1930	1931	1930
United Kingdom	650	300	2,291	8,148
British India	5,339	8,238	49,025	52,821
Germany	.....	.....	52	50
Netherlands	49	350	6,195	5,552
Canada	60	.....	137	392
France	.....	.....	25	.....
Belgium	.....	.....	100	.....
Norway	50	51	136	2,456
Sweden	.....	200	3,277	2,772
All others	.....	.....	733	43
Total	6,148	9,139	61,971	72,234

Large Press Has Special Two-Increment Feed

THE single crank press here illustrated, a product of the Niagara Machine & Tool Works, Buffalo, is equipped with a two-increment roll feed designed to punch a predetermined number of uniformly spaced holes in strip stock and to leave a longer, unpunched space at the end of the work.

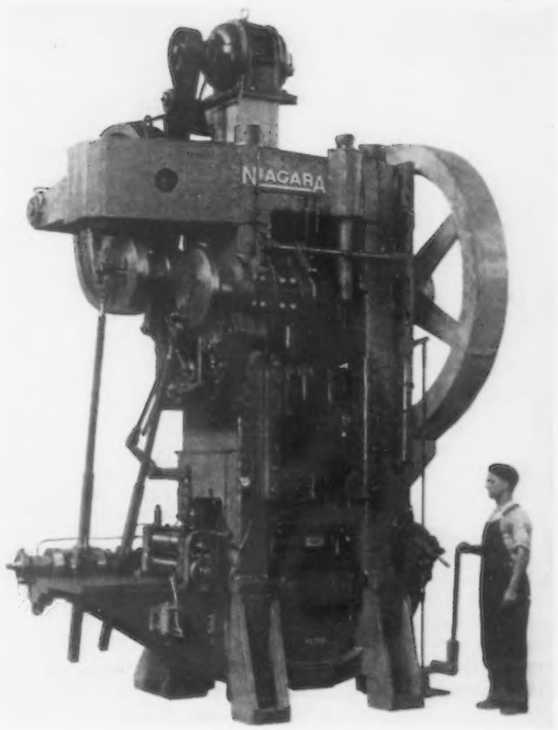
In operation, strips cut to length are inserted between the roll feed and through the opening in the press housing at the right. The operator engages the clutch and, after the required number of punchings have been made, the long feed comes into action. The required unpunched area is left at the end, the strip is carried free of the left-hand roll feed and the press stops automatically.

High speed production is obtained by operation at 42 strokes per min., single gearing being employed. The straight uprights provide the necessary strength and rigidity and the crown, uprights and bed are tied by large steel rods, shrunk in place. Especially large openings in the uprights are required because of the width of the stock.

The crown is of box section, reinforced by longitudinal and cross ribs. Heavily ribbed, the bed is of deep section, cast in a single unit with the legs. The lower tie rods clear the floor. Long gibs with large bearing surfaces guide the slide, which is counterbalanced by means of springs entirely inclosed in steel cylinders. An automatic multiple-disk clutch, operated either by hand or foot, controls the slide motion. It is built into the flywheel, which has anti-friction bearings and is mounted on the drive shaft.

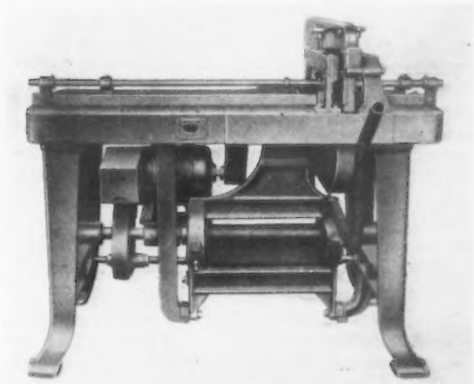
The brake, entirely separate from the clutch unit, is automatically released when the clutch is engaged and automatically applied to stop the press when the clutch is disengaged. When operating with the roll feed, the press may be stopped at any time by an emergency hand control. All gears are produced by the hobbing method and operate quietly. The press is arranged for belted motor drive, correct belt tension being maintained by a self-adjusting ball-bearing idler.

A SPECIAL-PURPOSE roll feed is designed to facilitate punching of groups of holes in strip stock in accordance with specified layout. Automatic stopping is provided.



New Cut-Off Machine Uses Abrasive Disk

EMPLOYING an abrasive disk, the No. 30 cut-off machine illustrated will cut certain materials up to 1 x 16 in. at the rate of 2 to 12 sec. per cut. The machine, a new product of Andrew C. Campbell, Inc., Bridgeport, Conn., will handle nickel-silver, soft iron, hardened high-speed steel and similar materials up to ¾ in. thick and 6 in. wide. Correspondingly wider cuts can be made on thinner stock.



To feed the wheel through the work, the spindle moves parallel to the table. This movement is obtained by a travel-arm mechanism without the use of slides. Dust and grit cannot enter the moving parts to affect the feed. Control of the feed is further aided by proper counterbalancing.

Both regular and irregular shapes can be handled and a straight edge is provided for locating the work so that the cut may be made at the proper angle.

Other features included are quick-acting adjustable clamps for holding the work and welded steel guards to protect the operator. The drive is by six V-belts from a motor provided with push-button control.

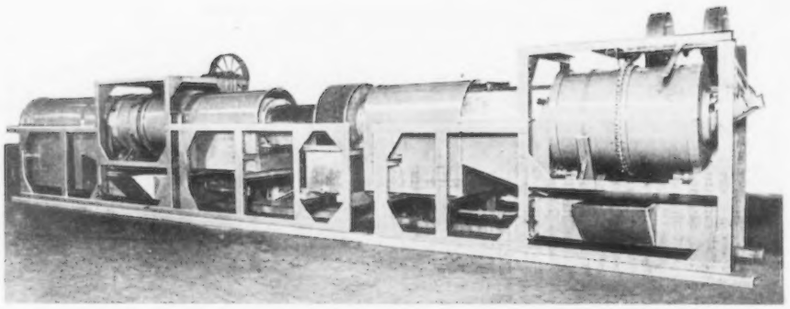
All-Metal Ball Bearing of Grease Sealed Type

A GREASE seal ball bearing of all-metal construction, designated as the Vacuum Seal, has been placed on the market by the Federal Bearings Co., Inc., Poughkeepsie, N. Y. No felt, leather, cork or other material is employed as a sealing agent. Lack of such frictional contact between rotating parts promotes free-running without drag or overheating at speed.

Sealing is effected by an impeller which is pressed on to the inner bearing ring and an outer seal spun into a recess in the outer race ring. In operation, these elements are described as forming a vacuum pocket which prevents suction of foreign material into the bearing. This vacuum, moreover, retains the grease which the impeller continually throws into the races and on to the balls where it is required.

Standard S.A.E. dimensions are maintained, the outer ring not being reduced in diameter or width to accommodate a sealing member.

Continuous Pickling Equipment for Small Metal Parts



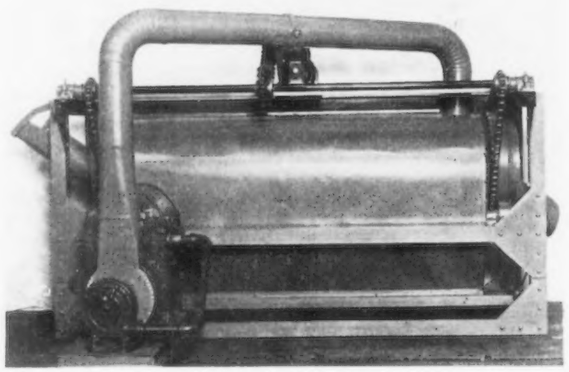
MORE rapid cleaning and pickling of screw machine products and other small metal parts at the plant of the Crosley Radio Corpn., Cincinnati, has been made possible by continuous processing equipment consisting of "Ideal" units installed by N. Ransohoff Inc., Cincinnati. Lower operating costs and a general improvement in the quality of the finished products are also claimed. The equipment is in two identical sets, arranged in parallel, but operating independently of each other.

Parts are dumped from shop receptacles into a power loading skip which charges the washing machine. Operation of the machine is continuous. In the first drum the work is given a thorough soaking wash. This is followed by a spray wash with cleaning compound under 35 lb. per sq. in. pressure that removes dirt loosened by the preliminary or soaking wash.

From the spray chamber the work passes to a rinsing drum, thence through a drum where it is pickled in a hydrochloric acid bath, and to another rinsing drum. These three drums dip into the tanks in which they rotate. The last rinsing drum discharges its work directly into plating barrels.

After plating, the work is rinsed through two drums and discharged to a rotary drier heated by a Maxon Premix gas-air burner. The work is distributed by a worm on the revolving screen of the drier and passes through a blast of heated air from a high speed blower. One of the parallel lines of equipment terminates in two drier units instead of one, giving small work a greater opportunity to spread out, thus assuring a thorough drying.

All worms are welded to remove possibility of small parts sticking to drums. Batches of different kinds of work can be put through the entire series of processes on a three-minute headway without danger of mixing.



PARTS are washed, rinsed, pickled and rinsed by successive elements of the assembly unit shown above; after plating, they are dried in the rotary heater illustrated at right.

Checking Fixture for Spiral Gear Leads

SPIRAL gears up to 16-in. diameter and with any lead of 10-in. or greater, either right or left-hand spiral, can be checked for accuracy of lead by means of the fixture here illustrated, a new product of the Michigan Tool Co., 7171 Six Mile Road East, Detroit. The increased number of spiral gears being used in automobile transmissions, it is pointed out, has necessitated accurate equipment for checking the lead or spiral angle of the gears. It is held to be preferable to check the lead rather than the spiral angle because the former is constant whether measured at the root diameter, pitch diameter, or near the outside diameter.

The gear to be checked may be mounted on a stub arbor or between centers up to 12 in. in length. Of the sine-bar type, the fixture is similar in operating principle to the company's equipment for checking the leads of worms and hobs. Accurate setting of the sine bar to the proper angle of the lead to be checked is facilitated by two measuring buttons. Settings may be made on either side of the center line, depending on whether right or left-hand lead is desired.

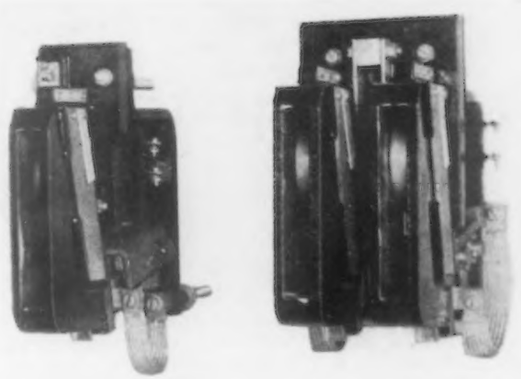
In operation, the indicator point is brought in contact with the side of the gear tooth and, by turning the handwheel, the indicator finger is caused to pass along the side of the gear tooth, any error of the lead being registered on the dial.

Zinc Institute Opposes Freight Rate Increase

J. D. Conover, secretary, American Zinc Institute, testified before the Interstate Commerce Commission in Chicago on Sept. 1 in the final hearings on the railroads' application for a 15 per cent freight rate increase. He pointed out the depressed condition in the zinc industry and gave figures showing that this condition has not only persisted but has become intensified, thus emphasizing the inability of the zinc industry to bear any increased burden of costs.

General Automatic Lock Nut Corpn., General Motors Building, New York, has appointed the Eccles & Davies Machinery Co., 320 South San Pedro Street, Los Angeles, Cal., as agent for the Pacific Coast and Hawaii.

Heavy-Duty Contactor for Crane, Mill and Other Service



Compact design permits close grouping of contactor units.

A NEW heavy-duty contactor for steel mill, crane and general purpose direct-current magnetic controllers which is compact and may be mounted very closely together since all parts are removed from the front for replacement, has been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh. Effective rupturing capacity is obtained by a new rapidly operating arc box and horns, along which the high flux blowout forces the arc. The fast opening of contacts assists in the rapid extinction of the arc, thus prolonging the life of contact tips, arc box and other adjacent parts.

The shunt, suspended about the center of rotation of the armature, has practically unlimited life. The bearing pins of the armature and contact arm are of nitrided alloy steel. This, together with low bearing pressure and reduction of vibration due to injurious bouncing of contacts on opening or closing, prolongs the life of the contactor parts.

Spray Guns Adjusted by Thumb Screw or Key

SPRAY guns that do not require adjusting nozzles, but which give any variation of round or fan spray simply by turning the control screw at the back of the gun without stopping operations, are being marketed

by the Binks Mfg. Co., 3114 Carroll Avenue, Chicago. They are made in two models, identical except that on one spray adjustment is made by a removable key and on the other by a stationary control.

The drop forged body, which has a tensile strength of 62,000 lb. per sq. in. is amply strong. The handle is die cast and the fluid nozzle is made of special stainless steel. The needle valve stem is of hardened stainless alloy steel and the air nozzle is of drop-forged bronze construction. A two-finger trigger having a light straight pull is employed. The air inlet through the handle balances the material hose thereby preventing downpull at the head. Clear passage of air parts prevents clogging and permits speedy cleaning. The air nozzle is described as being self alining, requiring no adjustment of nozzles at any time and fixed in position with respect to the fluid tip.

Use of the removable-key model enables the foreman to control the type of spray, the material used and the labor time. He may set each gun on a production line in the morning to the desired spray after which he removes the key and the sprayer cannot waste time making unnecessary adjustments.

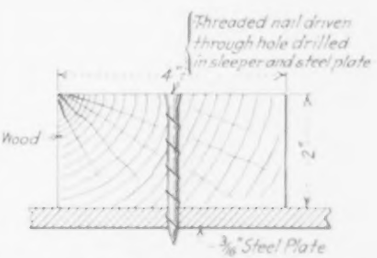
Applies Wood Sleeper to Battledeck Floor

POSSIBILITIES for variations in design of battledeck steel floor construction were exhibited before building experts, structural engineers, welding technicians and officials in charge of construction for the Cleveland Board of Education in a demonstration recently conducted in Cleveland.

An innovation was the introduction of a method of affixing wood sleepers to the steel floors. In most cases, where a wood floor is not necessary, it has been customary to surface the steel plates with cork or tile. The use of wood sleepers not only allows wood flooring but, in residence building, which is now turning to steel frame construction, provides a floor construction which offers the minimum of obstruction to pipes and conduits.

Wood 2 x 4's so-called are laid on the plates and drilled. The drill goes through the wood and the plate. A patented nail of special steel manufactured by the Hill Wood Mfg. Co., Cleveland, is then driven through the sleeper, threading itself into the steel as it is driven. Tests to remove the nails by wedges under the sleeper resulted in tearing off the wood without bending or starting the nail.

The flooring in this demonstration consisted of 5/16-in. steel plates, 4 ft.



A special nail is driven through a hole drilled in the wood and steel and threads itself into the steel.

wide, punched 24 in. from the edge of the plate with 11/16-in. holes on 12-in. centers. Half holes were punched along the edges of the plates. This flooring was carried on 5-in. I-beams over a 20-ft. span to support a live load of 75 lb. per sq. ft. The I-beams were spaced on 24⅛-in. centers.

The floor plates were fused to the I-beams by plug welds through the holes. With 3/16-in. electrodes of Lincoln Electric Co. manufacture these plug welds were made in less than 30 sec. each. The demonstration was conducted by the Carnegie Steel Co. in its Cleveland warehouse.

Carson, Marshall & Co., Inc., Franklin Trust Building, Philadelphia, has been appointed exclusive sales agent in the Eastern territory for Potter foundry coke, produced by Potter Coal & Coke Co., Greensburg, Pa.

Steel Exports Up and Imports Down, Both at Low Levels

WASHINGTON, Sept. 4.—Exports of iron and steel in July totaled 84,466 gross tons, a gain of 8881 tons over June, as stated in THE IRON AGE of Aug. 27, page 582. Small though it was, the tonnage exported in July showed the first increase since last March.

Imports in July, amounting to 37,190 tons, made a decline of 629 tons under June.

Principal products exported in July included 13,460 tons of scrap; 8790 tons of tin plate; 8753 tons of skelp and 6952 tons of black steel sheets. The best markets were Canada, 35,380 tons; Japan, 10,817 tons, and the Philippine Islands, 6462 tons.

China was the largest buyer of American tin plate, taking 2026 tons; Japan ranked second, 1231 tons; Argentina third, 1089 tons. Among the more important shipments of finished steel to Canada were 3843 tons of black steel sheets, 6292 tons of plain structural material and 3350 tons of plates. The Philippine Islands took 2043 tons of galvanized sheets.

Leading manufactured products imported in July were structural shapes, 7572 tons; pig iron, 6148 tons; merchant steel bars, 4287 tons. Imports from Belgium were 10,519 tons; Germany, 7230 tons; Canada, 5339 tons and India, 5339 tons, the latter being pig iron.

Of the structural shapes imported, 3920 tons came from Belgium; 1935 tons from France and 1504 tons from Germany. Belgium supplied 2046 tons of merchant bars, while 1161 tons came from France. Imports of reinforcement bars were 3039 tons, of which 2433 tons came from Belgium.

Canada furnished 2235 tons of the 2917 tons of ferromanganese imported while 347 tons came from the United Kingdom and 160 tons from Germany. Canada supplied all of the 2471 tons of scrap imported.

Imports of manganese ore totaled 38,470 tons. The principal sources of supply were Russia, 15,956 tons; Gold Coast of Africa, 9960 tons; Brazil, 7595 tons; India, 4622 tons.

In seven months the exports of scrap have declined 70 per cent from last year. The decline of 209,000 tons in that item is nearly one-third of the entire falling off in total exports. Two items showed increases over 1930—tanks, up 2 per cent; wire nails, up 11 per cent.

Exports of Iron and Steel from the United States

(In Gross Tons)

	July		Seven Months Ended July	
	1931	1930	1931	1930
Pig iron	370	453	3,581	9,615
Ferromanganese	88	54	1,139	5,059
Scrap	13,460	15,379	89,833	298,532
Pig iron, ferroalloys and Scrap	*13,918*	*15,886*	*94,553*	*313,206*
Ingots, blooms, billets, sheet bar	309	317	2,368	14,547
Skelp	8,753	9,698	41,861	64,866
Wire rods	1,708	2,266	22,096	28,117
Semi-finished steel	*10,770*	*12,281*	*66,325*	*107,530*
Steel bars	1,645	4,686	26,681	60,966
Alloy steel bars	100	145	2,449	4,925
Iron bars	139	122	715	1,003
Plates, iron and steel	3,616	7,874	32,481	69,509
Sheets, galvanized steel	5,192	7,325	33,619	59,752
Sheets, galvanized iron	198	554	3,271	4,142
Sheets, black steel	6,952	7,038	53,694	74,809
Sheets, black iron	329	1,097	4,260	7,084
Hoops, bands, strip steel	1,610	2,185	20,542	28,648
Tin plate; terne plate	8,790	17,273	52,184	138,377
Structural shapes, plain material	7,133	11,932	61,174	91,098
Structural material, fabricated	1,360	6,494	23,771	63,703
Tanks, steel	1,223	1,584	9,680	9,509
Steel rails	3,084	8,413	22,211	62,972
Rail fastenings, switches, frogs, etc.	1,133	1,472	5,173	12,199
Boiler tubes	416	765	4,651	10,096
Casing and oil-line pipe	1,115	3,225	16,940	45,007
Pipe, black and galvanized, welded steel	6,023	5,743	30,181	53,052
Pipe, black and galvanized, welded iron	602	925	3,644	10,618
Plain wire	1,049	1,815	8,447	17,390
Barbed wire and woven wire fencing	2,169	3,552	16,650	26,203
Wire cloth and screening	117	161	947	1,009
Wire rope	178	294	1,701	3,014
Wire nails	943	844	5,163	4,660
Other nails and tacks	368	433	2,428	3,822
Horseshoes	26	8	63	77
Bolts, nuts, rivets and washers, except track	437	821	3,310	6,843
Rolled and finished steel	*55,947*	*96,780*	*446,030*	*870,487*
Cast iron pipe and fittings	1,315	2,598	16,484	21,373
Malleable iron screwed fittings	267	680	3,319	6,920
Car wheels and axles	561	382	4,382	9,165
Iron castings	369	356	2,937	4,649
Steel castings	270	729	2,434	6,700
Forgings	523	813	5,161	5,800
Castings and forgings	*3,305*	*5,558*	*34,717*	*54,607*
All other	526	1,075	4,383	8,372
Total	84,466	131,580	646,008	1,354,202

Imports of Iron and Steel Products into the United States

(In Gross Tons)

	July		Seven Months Ended July	
	1931	1930	1931	1930
Pig iron	6,148	9,139	61,971	72,234
Sponge iron	.....	75	209	75
Ferromanganese and spiegeleisen*	2,917	5,020	17,078	40,871
Ferrochrome†	.....	18	96	162
Ferrosilicon‡	47	187	598	4,169
Other ferroalloys	200	240	990	240
Scrap	2,471	2,343	10,119	16,790
Pig iron, ferroalloys and scrap	*11,783*	*17,022*	*91,061*	*134,541*
Steel ingots, blooms, billets, etc.	819	2,507	12,446	11,450
Wire rods	687	485	4,652	6,363
Semi-finished steel	*1,506*	*2,992*	*17,098*	*17,813*
Concrete reinforcem't bars	3,039	849	25,289	
Hollow bar and drill steel	208	77	975	23,267
Merchant steel bars	4,287	3,490	28,192	
Iron bars	130	24	681	847
Iron slabs	.....	.....	40	
Boiler and other plate	93	51	722	1,787
Sheets, skelp and saw plate	1,413	1,007	12,722	17,003
Tin plate	36	40	95	135
Structural shapes	7,572	5,898	44,727	94,206
Sheet piling	.....	616	579	
Rails and rail fastenings	177	436	3,969	2,915
Welded pipe	640	505	4,201	3,148
Other pipe	509	358	5,748	9,541
Barbed wire	1,492	388	4,988	2,866
Round iron and steel wire	244	272	1,805	3,223
Flat wire and strip steel	91	52	398	813
Wire rope and strand	69	179	1,136	1,755
Other wire	48	17	388	215
Hoops and bands	1,867	2,375	11,459	12,599
Nails, tacks and staples	1,091	611	5,094	3,191
Bolts, nuts and rivets	138	9	662	246
Other finished steel	12	5	218	16
Rolled and finished steel	*23,156*	*17,259*	*154,088*	*177,773*
Cast iron pipe and fittings	681	1,734	5,966	8,401
Castings and forgings	64	76	1,071	1,077
Total	37,190	39,083	269,284	339,605
Manganese ore*	38,470	15,940	158,522	194,329
Iron ore	128,106	251,035	1,020,682	1,846,586
Magnesite (dead burned)	76	3,804	10,281	25,211

*Manganese content only.
†Chromium content only.
‡Silicon content only.

Tanks for Hauling Milk—A Growing Outlet for Steel

WASHINGTON, Sept. 4.—The rapid growth in the use of steel tanks for hauling and handling milk is reflected in a bulletin just published by the Department of Agriculture. It was prepared by Ralph R. Hotis, associate market milk specialist, Division of Market-Milk Investigations, Bureau of Dairy Industry.

The study was made to determine the methods of handling milk delivered to a milk distributing plant in tanks, the labor and time requirements of tank delivery, the advantages of such delivery and the cost of handling milk in this way. The bulletin points out that no system yet devised has fulfilled the requirements to the same extent as have the tank car and tank truck for regular, quick and sanitary delivery of the product to the city with least possible lowering in quality.

The year 1910 saw the first tank car and in 1914 the first tank on motor truck for use in the transportation of milk. Since then, Mr. Hotis says, the use of tanks has increased rapidly until at present some cities receive 70 to 95 per cent of their fluid milk in tanks.

The increase in the use of tanks is attributed to good roads, which permit motor vehicles to go into nearly every farming section in the country, and also to the great improvement in the motor vehicle itself. Furthermore, it is stated, in some cities, because of their rapid growth and their milk ordinance requirements, dealers have been compelled to obtain part of their milk supplies from outlying territories and, in their endeavor to maintain quality, price and ease of shipment, they have turned to tank hauling.

Data on 300 tank trucks, 89 trailers, and 53 tank cars were collected by the bureau in 1927-1929; and observations were made on 82 tank trucks, 29 tank trailers, and 28 tank cars.

Data collected on 438 tanks showed the following kinds of tanks in use, in the percentages given: Glass-lined steel, 84 per cent; tin-lined copper, 9 per cent; nickel, 6 per cent, and stainless steel, 1 per cent. The last-mentioned type is the latest to be put on the market. Of these tanks, 82 per cent were insulated. The insulating materials were cork, wood, felt, and canvas pads, given in order of frequency of use. In 87 per cent of the insulated tanks, cork approximately 2 in. thick was used, which was protected by heavy canvas, sheet aluminum or sheet steel. Either aluminum or sheet steel, Mr. Hotis says, is to be preferred, as they have a smoother surface, are easier to clean, and protect the cork better than canvas.

The type of chassis upon which a tank is mounted, it is explained, depends upon the capacity of the tank and the road laws of the State in which the tank is used. Most tanks up to 1250-gal. capacity are mounted on regular motor chassis. Where the load to be carried is larger than this, the tank usually is mounted on a semi-trailer; or in some cases two medium-sized tanks of 1000 to 1250-gal. capacity each are mounted on a six-wheel chassis.

The capacity of 252 tanks studied ranged from 500 to 2000 gal. Seventy-two per cent were of 1000 to 1400-gal. capacity, approximately one-third being between 1000 and 1100 gal. The 2000-gal. tanks were used on semi-trailer chassis. Tanks used on trailers did not vary so much as did those used on trucks, the capacity of the former ranging between 1050 and 1100 gal. The cost of 70 tanks mounted on motor trucks was obtained. Forty of these tank-trucks, or 57 per cent, cost $6,000 to $8,500 each; 17, or 24 per cent, cost $6,000 to $6500 each. The average cost was $5,994, and the range was from $2,500 to $9,762, the lower costs being those of small outfits and used equipment. The average cost per gallon capacity was $5.17.

Mr. Hotis says that the consensus of opinion of tank-truck owners and operators is that the economical limit of tank-truck hauling is from 120 to 150 miles per round trip, depending upon the type of roads and topography of the country.

Mr. Hotis also discussed the railroad milk tank car. This is of the express type, wired for electricity, equipped with four-wheel trucks designed for high speed, with thoroughly insulated body, and with acid-resisting waterproof floor sloping to the center of the car and equipped with a drain. The car floor is 4 ft. 2⅞ in. above the rails. A glass-lined steel tank is mounted at each end of the car. The standard capacity of a tank is 3000 gal., although some recently-made tanks hold 3820 gal. Milk plants get the use of tank cars in two ways: by purchase from the manufacturers or by daily rental. Repairs on cars are made by the railroad at its shops and the cost is charged to the company owning or renting the cars. The average one-way haul by tank cars on 36 routes throughout the country was 122 miles. In the case of use of this kind of tank, the bulletin also pointed to the necessity of having supplemental tanks as a protection against breakdowns, delays in schedules or bad weather. Mr. Hotis quotes tank owners and operators as saying that a plant with eight to 10 regular cars should have one or two cars in reserve.

The study is known as technical bulletin No. 243, "Transporting and Handling Milk in Tanks."

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Business Men Will Visit 13 Research Laboratories

Through its division of engineering and industrial research, the National Research Council has organized a party of 100 leading business men and bankers to make a tour of research laboratories starting from New York, Oct. 5, according to an announcement from the headquarters of the division in the Engineering Societies Building, 29 West Thirty-ninth Street, New York. There was a similar tour last October under the same auspices when nearly a hundred executives visited nine laboratories in seven cities.

Thirteen research organizations, different from those on last year's program, will be visited on the forthcoming tour. The members of the party will see how many of the nation's industries, small and large, are utilizing scientific research in solving major problems in a period of business depression. The importance of research to the smaller type of industrial concern will be emphasized during the trip. The trip will be made by boat from New York to Boston and by special train during the remainder of the journey. The party will return to New York on Oct. 15. The complete itinerary is as follows:

Oct. 6, laboratories of the Massachusetts Institute of Technology; Arthur D. Little, Inc.; Dewey & Almy Chemical Co.; United Drug Co., and the Thompson & Lichtner Co., situated in Boston and Cambridge. Oct. 7, Eastman Kodak Co., Rochester, N. Y.; Oct. 8, Ford Motor Co., Detroit; Oct. 9, Nela Park, Cleveland; Oct. 10, Goodyear Tire & Rubber Co. and the Goodyear-Zeppelin plant, both situated at Akron, Ohio; Oct. 12, Tanners' Council of America and the Basic Science Research Laboratory, the latter identified with the General Foods Corp., both at the University of Cincinnati; Oct. 13, Battelle Memorial Institute, Columbus, Ohio; and Oct. 14, the Westinghouse Electric & Mfg. Co., East Pittsburgh.

Details of the tour have been worked out by Maurice Holland, director, and William Spraragen, secretary, of the division of engineering and industrial research of the National Research Council. Prof. Dugald C. Jackson, head of the electrical engineering department at Massachusetts Institute of Technology, is chairman of the division.

Drop Forgers Discuss Trade and Technical Problems

IMPROVEMENT in the design of hammers and presses used in the forge shop proved an interesting topic of discussion at the fall meeting of the American Drop Forge Institute held at the Chamber of Commerce, Cleveland, Sept. 2 to 4, at which there was an attendance of about 70. The character of this discussion was somewhat of an innovation in that the principal speaker, a manufacturer of forge shop equipment, appeared before a group of practical forge shop operators to ask suggestions for making hammers and trimming presses more efficient tools.

Favors Two-Stroke Hammer

The leader of this discussion was D. A. Currie, vice-president and general manager, Erie Foundry Co., Erie, Pa., who was listed on the program for an address on motor-driven hammers, but this was changed to a round table meeting led by Mr. Currie, who submitted a typewritten list of questions covering largely details in the design of presses and hammers and invited his audience to express their views on the points raised. Considerable valuable information was brought out in the discussion.

On the subject of length of strokes of steam and board drop hammers Mr. Currie said that the tendency is toward shorter strokes and heavy rams, the strength, durability and rigidity of the hammer being increased by building it with a short stroke. His company built a variable-stroke hammer, but has not put it on the market; in his opinion it requires too much mechanism and will not stand very long service without repairs. He believes hammers with two strokes, a full and a two-thirds stroke, or other fixed variation, would be practical, with the length of stroke being controlled by the foot treadle. He would like to give up the idea of a variable-speed hammer and devote his attention to a two-stroke machine. Several of the forge men expressed the belief that it would be an advantage to have hammers with two strokes.

Motor-Driven vs. Belt-Driven Hammers

One question related to the operating cost and production of belt-driven as compared with motor-driven board drop hammers. Mr. Currie said that as the motor-driven hammer is comparatively new, production and cost figures are not yet available. However, he believes that the motor-driven hammers will produce more, as they will run continuously. Ernest Harris, Harris-Thomas Co., Dayton, said his company is using both types and he doubted if the motor-driven hammers are worth the 50 per cent extra cost, although he is glad to use the motor-driven hammer on a small job when the line shaft is not running for their belt-driven hammers. Later in the discussion it was brought out that the cost of a 4000-lb. motor-driven board drop hammer is 20 per cent higher than a steam hammer of equivalent high-grade construction. Mr. Currie said that he did not favor using for the motor - driven hammers the cheaper construction that is employed in some of the board drop hammers.

In the discussion as to whether provision for alining dies right and left be built into the hammer it was brought out that owing to small orders die changes are more frequent than formerly. Consequently, any improvements that would reduce the time in changing dies would be of value.

Costs Reduced by Standardization

Manufacturing costs and selling prices of trimming presses could be reduced by standardization, said Mr. Currie in a discussion of types of frames for trimming presses. This discussion brought out a rather emphatic complaint from R. T. Herdegen, Dominion Forge & Stamping Co., Walkerville, Ont., about the method of rating presses. He urged manufacturers to get together and establish a standard system of rating. Users of different makes of presses find it very difficult, he said, to figure out their comparative ratings. Mr. Currie replied that it would be difficult to induce press manufacturers to standardize ratings, because many of them make presses for work other than for trimming forgings.

As only half the questions had been discussed when the time arrived for closing the session, it was decided to continue the inquiry and obtain a more general expression of opinion by means of a questionnaire containing the list of questions which will be sent to the members. The replies will be tabulated and probably presented at the next meeting. One of the questions relates to forge shop economies. This asks, "What is the most desirable pressure for steam and compressed air for hammer operation? Which is the most economical? Is superheated steam desirable?"

Pleads for Sound Trade Practices

During the opening session, C. H. Smith, Steel Improvement & Forge Co., Cleveland, president of the institute, gave an address on "The Association—What It Can Mean to You." He said that the institute is no different from other institutions in that it has two difficulties to fight. One is overproduction due to too many forging manufacturers and the other is the competition brought out by distrust and the wild scramble for volume without thought of profits and the disaster that follows. To some extent he said the latter can be overcome and corrected through trade association activities. It is in times like the present that associations need their greatest support.

History shows, he said, that where an industry is under the regulation of sound trade practices results have been twofold. The industry has prospered and the economic measures adopted have proved to the best interests of the public. He said that the association now has one of the finest cost systems and spoke of the value of the statistical information that it prepares every month. Much can be done, he declared, in aiding management with its production problems. He called attention to the wide variance in cost estimates of certain types of forgings and said that executives should give this subject more attention. A handbook committee composed of shop and technical men and executives of forge shops, which was formed last year, is now at work and he said its report will be a valuable addition to the constructive program of the institute.

Industries that will lead the way out of the present period, according to the speaker, will be those that have a fixed trade association program founded on sound principles. Members should realize what an association can do and how through cooperative efforts they can help promote better standards and greater efficiency and eliminate wasteful practices and abuses.

Contest Reduces Accidents

Safety contests as a method of arousing interest in accident prevention among factory workers were urged by Judge Lee E. Skeel, president Cleveland Safety Council, in an address on the importance of safety work, which he emphasized by presenting figures covering accidents and payments of death and injury claims. Referring to a safety contest that is being sponsored by the Industrial Commission of Ohio, he said that there had been a 25 per cent reduction in accidents in the past three months in 360 factories and other places of employment taking part in the contest. It was brought out that the shifting of men from their own jobs to work with which they are less familiar during the present period of reduced plant operation has a tendency to increase the number of accidents.

President Smith said that the institute is considering a competitive safety compaign among its members.

Scope of Trade Association Activity

What trade associations are doing to aid industry was the main theme of an address by P. P. Gott, manager Trade Association Department, Chamber of Commerce of the United States. Some of these activities, he said, will

tend to reduce or eliminate causes of criticism of the present capitalistic system. Unfair and uneconomic competitive practices, he declared, cannot be eliminated by individuals acting independently and the principle of self-regulation can be maintained only through trade associations. The speaker stressed their efforts to eliminate waste as one of the important accomplishments of trade associations. Waste, he said, is being reduced by trade promotion campaigns through cooperative advertising, by market research that reveals unprofitable items and sales efforts, by educational programs, by uniform cost accounting systems and by standardization of products. Losses due to waste in production and to overproduction, he said, may be greatly reduced by the intelligent use of statistics. Efforts to relieve the unemployment situation may be promoted by trade associations by staggering work, maintenance and repair work and stimulating sales.

Other speakers were W. E. Johnston, president Johnston Mfg. Co., Minneapolis, who talked on combustion, and Marc A. Rose, managing editor, *Business Week*, whose subject was "Must We Have Depressions."

An informal banquet was held Thursday evening, at which F. W. Sinram, president Gears & Forgings, Inc., Cleveland, was toastmaster and H. G. Stoddard, Wyman & Gordon, Worcester, Mass., was the speaker.

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Wage Reductions Affected Only 8224 Iron and Steel Workers

Decreases in Rates in Seven Months of 1931 Mostly in Small Plants, Says Labor Department

WASHINGTON, Sept. 8.—Wage rate reductions in the iron and steel industry reported to the Bureau of Labor Statistics, Department of Labor, affected only 8224 employees in the first seven months of 1931. With the number of employees in the average of 193 reporting plants amounting to 220,632, the decreases in wage rates affected only 3.77 per cent of the total number of workers. The cuts in rate of wages were reported by 25 plants, or approximately 13 per cent of those making returns to the bureau.

That the decreases in wage rates were made by small plants only is shown by the comparatively slight number affected. Equally remarkable is the fact that the average rate of reduction reported was but 7.2 per cent.

Based on this calculation, the wage rate maintenance in the iron and steel industry reaches the high total of 96.23 per cent.

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Changes in Rates of Pay in Iron and Steel Industry in First Seven Months of 1931

	Plants Reporting	Plants Reporting Decreases	Weighted Average Decrease	Total Number Employees Affected	Per Cent of Employees Affected in Plants Reporting Decreases in Wages
July	191	4	9.5	687	51
June	194	2	4.5	398	62
May	189	4	9.3	1,102	99
April	187	1	5.0	110	100
March	190	4	10.5	4.503	86
February	199	3	6.8	555	85
January	199	7	4.9	869	45
Total	*193	25	*7.2	8,224	*75.5

*Average.

Proportion of Full Time Worked in Iron and Steel Industry in First Seven Months of 1931

	Number of Plants	Per Cent Idle	Per Cent of Establishments in Which Employees Worked: Full Time	Per Cent of Establishments in Which Employees Worked: Part Time	Average Per Cent of Full Time Reported by: All Operating Establishments	Average Per Cent of Full Time Reported by: Establishments Operating Part Time
July	132	6	27	67	77	68
June	143	7	38	55	80	65
May	140	7	48	45	84	66
April	132	5	55	40	86	66
March	128	5	59	35	87	66
February	128	7	57	36	86	65
January	127	7	57	36	85	62

March Made Best Showing and July the Poorest This Year

Workers' wages in the iron and steel industry, as in other lines, of course have been reduced by part-time employment and layoffs. The actual per capita weekly earnings of iron and steel workers in 1931 attained the highest point in March and amounted to $27.11, a decrease of 13.5 per cent from March, 1930. Earnings have declined steadily since then, with the lowest total, $20.62, in July, a reduction of 21.6 per cent from the corresponding month of last year. The greatest number of workers engaged, with 190 plants reporting, also was in March, with a total of 229,623, whose weekly payroll of $6,225,378 was the highest of the year, though it was closely approached in April with 187 plants reporting 226,930 workers with a weekly payroll of $6,123,289. The low point again was in July, with 191 plants reporting 200,220 employees whose weekly payroll was $4,127,714.

Indexing the monthly average of 1926 as 100, employment in the iron and steel industry was 76.2 in both March and April, 1931, as against 90.3 and 90.8 in corresponding months of 1930, and dropped in July to 69.7, as against 83.9.

Of 128 plants reporting in March, 5 per cent were idle, 59 per cent worked full time and 35 per cent part time, the remaining 1 per cent being accounted for by fractions which are not carried by the bureau. The average per cent of full time reported by all operating establishments in March was 87, while the average of full time reported by plants operating part time was 66 per cent. The low point, reached in July, showed that of 132 plants reporting, 6 per cent were idle, 27 per cent worked full time and 67 per cent part time. The average per cent of full time reported in July by all operating establishments was 77, as against 68 per cent for those operating part time.

In the machine tool industry, the reports show an average of 149 plants reporting, with 14, or 9.39 per cent, making wage rate decreases during the 1931 seven-month period. The weighted average decrease was 10.4 per cent. The number employed reached the lowest point in July, with a total of 21,186, the weekly payroll amounting to $492,400, a reduction of 36.1 per cent in number and 41.5 per cent in amount when compared with July, 1930.

In foundry and machine shop products, an average of 1074 plants reported, 134, or 12.4 per cent, making wage rate decreases whose weighted average was 10.1 per cent. The smallest number employed was in July, with 1046 plants reporting 174,720 workers with a weekly payroll of $3,831,182.

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Indexes of Employment and Payroll Totals in Iron and Steel Industry

(Monthly average, 1926=100)

	Employment		Payroll Totals	
	1931	1930	1931	1930
July	69.7	83.9	48.3	74.4
June	70.7	87.7	54.1	87.0
May	74.2	90.7	62.1	92.0
April	76.2	90.8	67.3	94.3
March	76.2	90.3	67.8	93.1
February	75.1	90.8	64.9	93.8
January	74.8	88.7	58.8	85.1

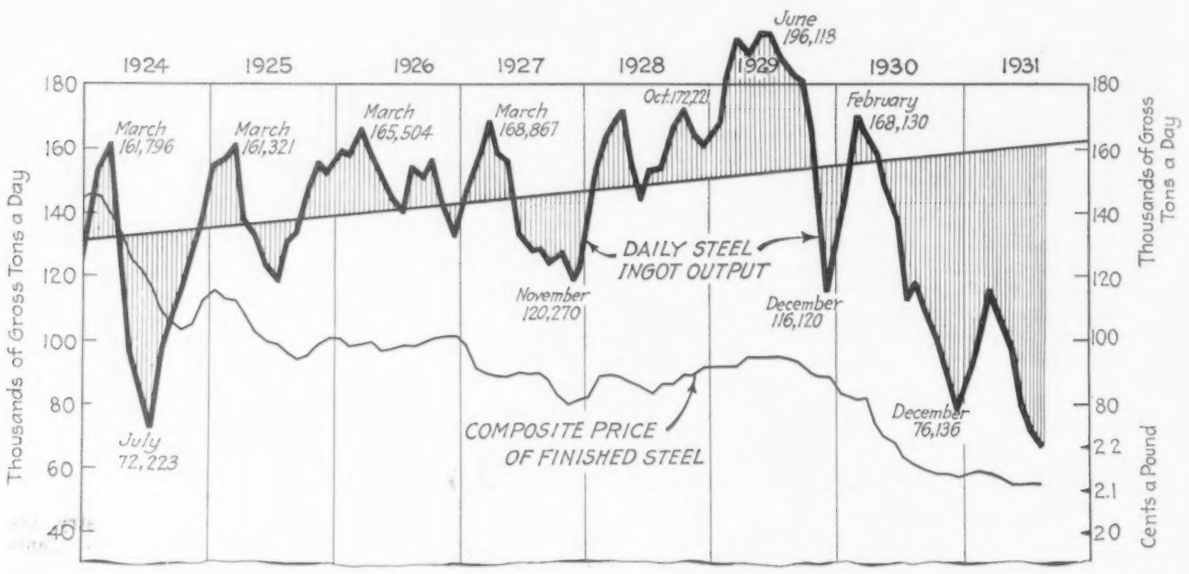
Comparison of Employment and Payroll Totals in Iron and Steel Industry in First Seven Months of 1931

	Number of Plants	Number on Payroll	Amount of Payroll (One Week)
July	191	200,220	$4,127,714
June	194	213,774	4,889,702
May	189	221,414	5,542,759
April	187	226,930	6,123,289
March	190	229,623	6,225,378
February	199	226,458	5,969,066
January	199	226,006	5,413,666

Per Capita Weekly Earnings in Iron and Steel Industry

	1931	Per Cent Decrease Under 1930
July	$20.62	21.6
June	22.87	22.8
May	25.03	17.5
April	26.98	14.7
March	27.11	13.5
February	26.36	16.1
January	23.95	18.1

Ingot output in August showed a slower decline than in July and June. The total was the smallest for any month since 1921. Prices averaged a trifle lower.



Reduction in Ingot Output Slows Up Still More

WHILE continuing the decline begun in April, steel ingot production in August made a smaller drop from the preceding month than has been the case in any month of the current decline. This drop was about 8.8 per cent, compared with 9.1 per cent in the preceding month and 17 per cent in June.

Production of open-hearth and Bessemer ingots in August is calculated by the institute at 1,719,462 gross tons, compared with 1,886,153 tons (revised) in July. Both figures are well below that for last December, which was the lowest month's total, up to that time, since July, 1924.

On the daily basis, production was 66,133 tons. This compares with 72,544 tons (revised) in July and 115,139 tons at the year's peak in March. August of last year showed 117,722 tons. Not since 1921 has the August output been so low. In that year it registered 48,156 tons a day, and the three succeeding months showed substantial gains.

PRODUCTION OF OPEN-HEARTH AND BESSEMER STEEL INGOTS
(Gross Tons)

	Reported by Companies Which Made 95.21 Per Cent of the 1930 Ingots		Calculated Output of All Companies		No. of Working Days
	Open-Hearth	Bessemer	Monthly	Daily	
Total, 1929	44,101,321	7,091,680	54,312,279	174,639	311
1930					
January	3,157,761	441,572	3,778,235	139,935	27
February	3,335,428	508,618	4,035,111	168,130	24
March	3,513,269	539,616	4,254,331	163,628	26
April	3,405,671	509,234	4,109,492	158,057	26
May	3,265,353	528,968	3,982,915	147,515	27
June	2,849,079	407,586	3,418,535	136,739	25
Six months	19,526,561	2,935,594	23,578,619	152,120	155
July	2,430,128	353,723	2,922,220	112,393	26
August	2,541,367	374,467	3,060,763	117,722	26
Eight months	24,498,056	3,663,784	29,561,602	142,810	207
September	2,275,910	429,975	2,840,379	109,245	26
October	2,165,341	399,704	2,692,539	99,724	27
November	1,807,153	300,339	2,212,220	88,489	25
December	1,659,026	226,786	1,979,547	76,136	26
Total, 1930	32,405,466	5,020,588	39,286,287	126,322	311
1931					
January	2,044,298	296,620	2,458,689	91,063	27
February	2,085,529	296,972	2,502,366	104,265	24
March	2,504,060	346,139	2,993,590	115,139	26
April	2,275,404	316,668	2,722,479	104,711	26
May	2,083,833	301,639	2,505,485	96,365	26
June	1,730,109	246,365	2,075,910	79,843	26
Six months	12,723,233	1,804,403	15,258,519	98,442	155
July	1,570,776	225,030	1,886,153	72,544	26
August	1,462,469	174,631	1,719,462	66,133	26
Eight months	15,756,478	2,204,064	18,864,134	91,131	207

Eight-Month Total Off 36 Per Cent

PRODUCTION in the eight months is calculated at 18,864,134 tons. This is 36.2 per cent below the 29,561,602 tons made in the first eight months of 1930. Bessemer tonnage in this comparison dropped off 39.8 per cent and open-hearth tonnage 35.7 per cent from last year.

These figures do not include electric or crucible steel. To allow for these grades, about 0.8 per cent should be added.

On the basis of estimated capacity as of Dec. 31 last, production in August is given by the institute as 31.13 per cent, compared with 34.15 per cent in July. For the eight months the average has been 42.90 per cent, compared with 71.33 per cent in the corresponding eight months of 1930.

Automobile Industry Will Center on Model Changes in Fourth Quarter

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DETROIT, Sept. 7.

AS the fall season draws nearer, the fact becomes more apparent that recovery in automobile production is likely to be postponed beyond the time that the industry had anticipated. September holds little promise of equaling August's record, and developments in the past week point to a continuation of operations on the present low scale during the greater part of October.

With hopes of improvement this month rapidly fading, the industry is looking ahead to the fourth quarter to try to ascertain what the trend will be. Admittedly, retail sales are declining and no one is foolhardy enough to believe that the downward movement will be halted during the remainder of the year. Under the circumstances any increase in output must come from the necessity of stocking dealers with new models; it is on this factor as a stimulant to manufacturing activities that the steel trade is pinning its hopes for tonnage releases from the motor car people.

The general feeling seems to be that this demand will come late in September, but at this writing it looks as though steel mills may not benefit much until October. The main reason for this statement is that Ford will not get production on a revamped car under way until considerably later than anticipated, and other makers, including Chevrolet, may not start turning out 1932 models until November. It is agreed in Detroit that predictions regarding the turn of events in the industry are based on what the Ford Motor Co. will do in the next 30 to 60 days.

Although production figures for August are not yet available, latest reports are that output was nearer 200,000 than 175,000 cars, and somewhat higher than expected. It is believed that final returns will show the standing at 190,000 to 200,000 cars. There is a possibility that this month will be about 180,000 instead of 160,000 units, as mentioned a week ago, but it is too early to tell what will happen during the latter part of September.

Revised returns for August show motor car production was 190,000 to 200,000 cars, somewhat higher than expected. September assemblies may reach 180,000 units.

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Ford will make at least 50,000 more of its present line before switching over to production of new car, which probably will not be started until some time in October. New car may not be put on market until December.

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Chrysler and Hudson are inquiring for prices on steel for the fourth quarter, providing a test of present quotations on bars, strip steel and sheets.

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Chevrolet made 54,958 cars in August, compared with 51,622 in same month of 1930. In first eight months of this year it assembled 643,410 cars, as against about 650,000 by Ford.

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Ford Model May Be Delayed

Happenings the past week indicate that the Ford Motor Co. probably will not get into production on its new car until some time in October, or possibly Nov. 1. It is understood to have decided to make 50,000 or more of its present line before going over to the new car, and last Wednesday unexpectedly placed an order for steel under its old specifications to be delivered immediately. It is believed that this order was to balance stocks in cleaning up work on old models. Aside from a few purchases for experiments on new parts for the car now in the making, this is the first steel release given by the Ford company since late in June.

Orders for parts for the new Ford are being held up pending decision about the exact time when assemblies will be started. Two local companies which furnish most of the Ford bodies have been busy on changes in dies, jigs and fixtures, but are not yet turning out the new bodies. It is reported that the Hamilton, Ohio, wheel plant of the Ford company is now producing wheels for the new car, but a Detroit wheel company supplying Ford still is manufacturing wheels for the present model and will not change over to the new wheels until about Oct. 1.

The new Ford, according to local reports, will incorporate free wheeling, the device to be made by a central Indiana parts company. There is some talk about malleable iron brakes being substituted for steel brakes, the hub and brake shoe to be cast as an integral part. Experiments have been made with chrome nickel cast iron brakes, but the malleable brakes were given the preference because of their lighter weight and smaller cost. The use of rustless steel on the forthcoming models probably will be about the same as on the present car. It is understood that Ford engineers are well satisfied with the results they have obtained with rustless steel and all parts now made of that material will continue to be manufactured from it when the new car appears. Postponement of production on the new Ford is taken as a sign that it will not be on the market until Dec. 1 and possibly not until about show time at the turn of the year.

Chevrolet Production High

Chevrolet production in August totaled 54,958 cars, compared with 51,622 in the same month of 1930. August is the fourth successive month

this year to show a gain over the corresponding month of last year. In the first eight months of 1931, Chevrolet manufactured 643,410 cars. In August, 50,985 units were made for the domestic market, against 47,264 a year ago. Current employment by the Chevrolet company is put at 33,000 men. Extensive purchases of machine tools for its Toledo, Ohio, plant is taken as proof that Chevrolet intends to make a radical change in its transmission next year, and the trade still leans toward the opinion that the new Bendix clutch control will be featured. Chevrolet has made its last steel purchases until it is ready to start work on its new line.

Chrysler Inquires for Steel

The Chrysler Corpn. is now inquiring for prices on its fourth quarter steel needs, including bars, strip steel and sheets. It is expected that this business, which should be placed in the next week, will provide a test of steel quotations, as it is regarded as exceptionally attractive. During the third quarter the bulk of the tonnage went to one company. The Hudson Motor Car Co. likewise is asking for fourth quarter prices, apparently not so much for the purpose of placing much tonnage in the immediate future as for estimating the cost of parts on its 1932 models.

Plymouth Registrations Lead

So far as the Plymouth is concerned, it again led in new car registrations in Wayne County (Detroit) during August, with 847 cars, compared with 550 for Ford and 507 for Chevrolet. Plymouth production, however, is declining, and last week one of the body companies supplying Plymouth bodies is understood to have delayed placing steel orders because its schedule from Plymouth has been curtailed. There is a feeling in the industry that the Chrysler people have made a bold stroke in bringing out the new Plymouth and have put themselves into the midst of the fight in the low-priced field almost overnight.

Buick shipped 4298 cars in August, against 5320 in July and 20,004 in August, 1930, when it was in full swing on its new line announced at that time. Buick is closing departments on a staggered plan during the next three weeks, but will resume operations on a regular basis the last week of September. Auburn-Cord shipments last month were 1803 cars, compared with 2507 in July and 609 in August of last year. Total shipments this year were 32,045 cars, against 13,693 for the entire year 1930. Studebaker turned out about 3000 cars in August, but this month's output will be somewhat lower. Nash's production is at a low point, with little prospect of improvement ahead. Reo has been doing fairly well, with its new light-duty truck supporting sales to a considerable degree. Hudson-Essex is going along at a poor rate while preparations are being made for its 1932 line.

Great Activity in Die Making

Small shops making dies, jigs and fixtures continue their unusual activities, many of them running night shifts in order to fill orders for automobile companies getting their next year's models ready. It is said that much of the die casting work is being taken at prices so low that a profit is out of the question.

The Indiana Motor Truck Corpn. at Marion, Ind., is to manufacture Diesel-motored trucks with first deliveries promised early in October. The motors will be built in the Marion plant. It will be recalled that experimental runs have been made this year to demonstrate the economy of operating a Diesel-engined vehicle. The industry is following with interest this development.

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First Fall Meeting of the New Jersey Steel Treaters

On Monday evening, Sept. 14, the New Jersey chapter of the American Society for Steel Treating will hold its regular monthly meeting, at which W. R. Frazer, metallurgist of the Eclipse Aviation Corpn., East Orange, N. J., will speak on "Aircraft Engine Starters." The meeting will be held at the Washington Restaurant, 559 Broad Street, Newark, preceded by a dinner. Before the lecture, Lieut. Z. Soucek, holder of the world's altitude record for flying boats of one-ton loads, will give a short talk on "High Altitude Flying."

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Only 67,800 Tons of Beehive Coke

Beehive coke produced in the United States in August is placed by the Bureau of Mines at 67,800 net tons, a new low record. This compares with 75,900 tons in July (26 working days each month) and with 168,300 tons in August, 1930 (also 26 days). In eight months the total has been 908,700 tons, against 2,096,600 tons in eight months of 1930, a drop of 56.7 per cent.

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Central Iron & Steel Co., Harrisburg, Pa., manufacturer of sheared and universal steel plates, flanged and dished boiler and tank heads and floor plate, has opened a Southeastern sales office in the William-Oliver Building, Atlanta, Ga., in charge of Stanley A. Hunt, district sales manager. Mr. Hunt has been connected with the New York State sales office.

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Fuller Lehigh Co., New York, has moved its Boston office from 80 Federal Street to 49 Federal Street. H. H. Leathers is district sales manager.

Automotive Engineers to Join Metal Congress

The Society of Automotive Engineers has arranged to meet in Boston the week of Sept. 21 as part of the National Metal Congress and Exposition. R. S. Burnett, manager of standards for the S. A. E., has arranged a session dealing with problems of the automobile industry from the standpoints of metallurgy, production and cost. This session will be held Wednesday morning, Sept. 23, at the Hotel Statler.

Members of the S. A. E. will also attend the sheet steel and stainless alloys sessions of the American Society for Steel Treating on Tuesday and Friday mornings respectively.

In New York on Aug. 4 officials of the A. S. S. T., A. I. M. E., A. S. M. E., A. W. S. and S. A. E. met to make final plans for the Congress. It was decided that all technical sessions will be held at the Hotel Statler except those of the welding society, which will be at the Copley Plaza. Registration for the A. S. S. T. will be at Commonwealth Pier, where the exposition will be held. The A. W. S. will register at the Copley Plaza and members of all other societies will register at the Statler.

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Steel Barrel Output Gained in July

WASHINGTON, Sept. 8.—The output of steel barrels rose to 563,479 in July from 552,955 in June, according to reports received by the Bureau of the Census from 27 establishments. The operating capacity was 39.5 per cent as against 38.9 per cent. Shipments increased to 564,061 from 549,781 barrels, while stocks at the end of the month declined to 44,907 from 45,489 barrels.

Unfilled orders for delivery within 30 days made a slight drop to 238,258 from 239,290, while unfilled orders for delivery beyond 30 days were reduced to 702,081 from 838,248.

Production in the first seven months of 1931 totaled 3,741,152 barrels, compared with 4,791,179 in the corresponding period of last year. Shipments declined to 3,764,648 from 4,790,608.

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Orders for enameled sanitary ware in July totaled 178,377 pieces, against 169,800 pieces in June, according to reports received by the Bureau of the Census from 21 manufacturers who comprise practically the entire industry. Orders in the first seven months of the year totaled 1,138,080 pieces, compared with 1,516,276 pieces in the corresponding period of last year.

... PERSONALS ...

W. A. IRVIN, vice-president in charge of operations of the American Sheet & Tin Plate Co., has been named vice-president of the United States Steel Corpn., with headquarters in New York. He was born in Indiana, Pa., and received his formal education in the public schools of that town, which he supplemented with night courses at the Indiana State Normal School. He entered the employ of the Pennsylvania Railroad Co. in 1888 as a telegraph operator and later became clerk and assistant freight and ticket agent at Indiana. In 1895 he went to work for the P. H. Laufmann Co., Ltd., Apollo, Pa., manufacturer of sheets and tin plate, as a shipping clerk, and subsequently worked through the operating department of that mill, filling various positions up to that of superintendent. He became identified with the American Sheet Steel Co. when it took over the Laufmann company in 1900, going to the general offices of the company in New York. The merging of the American Sheet Steel Co. and the American Tin Plate Co. into the American Sheet & Tin Plate Co. in 1904 and the transfer of the general offices to Pittsburgh took Mr. Irwin to Pittsburgh as assistant to the operating vice-president. He continued in that capacity until his appointment as vice-president in charge of plant operations on Nov. 10, 1925.

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HARRISON HOBLITZELLE, executive vice-president of the General Steel Castings Corpn., Eddystone, Pa., has been elected president to succeed R. H. RIPLEY, who has resigned as president, but who continues as chairman of the board.

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W. C. BUCHANAN, vice-president of the Keystone Steel & Wire Co., Peoria, Ill., has been made a director of the company.

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C. W. TRAUGHBER has been appointed technical and metallurgical adviser to the Northern Blower Co., Cleveland. He has had a long experience with fumes, ash and general dust problems in his work with the Anaconda Copper Co., American Smelting & Refining Co. and other large smelting plants.

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W. C. BRUTON, for many years identified with the Oakland, Cal., office of the American Manganese Steel Co., has been made district sales manager for the Pacific Northwest, with office at 411 Colman Building, Seattle. P. R. HINES, Lewis Building, Portland, Ore., and Paragon Supplies, Ltd., East Vancouver, B. C., continue as agency representatives.

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EARL B. BREMER, who has been located for 13 years in the Chicago office of the Westinghouse Electric & Mfg. Co., recently as manager of the small motors section, has been appointed manager appliance electrification, with headquarters at East Springfield, Mass.

WILLIAM A. IRVIN

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OLIVER SMALLEY, director, technical department, of the Gray Iron Institute, Inc., was the guest of the New England Foundrymen's Association in Boston on Sept. 9. He spoke on factors pertinent to the design of gray iron castings, and on gray iron castings of the future.

FRANK J. TONE, President of the Carborundum Co., Niagara Falls, N. Y., who as announced in these columns on Aug. 27 has been awarded the Jacob F. Schoellkopf gold medal of the American Chemical Society for his work on the properties and commercial applications of silicon carbide.

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FREDERICK T. MOORE, vice-president and works manager of the Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., recently celebrated his fortieth year in the service of the company.

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HENRY M. TOCH, president, Toch Brothers, Inc., maker of technical paints and waterproofing compounds, New York, has retired, but will continue as chairman of the board of Standard Varnish Works. Dr. Maximilian Toch succeeds his brother as president of Toch Brothers, Inc.

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GEORGE H. HANNUM, formerly president of the Oakland Motor Car Co. and later with the Buick Motor Co., has been appointed general manager of the Heintz Mfg. Co., Philadelphia, maker of automobile bodies and other pressed metal products. He was at one time connected with the I. P. Morris Division of William Cramp & Sons.

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JAMES A. CARRUTHERS, who has been connected for the past 27 years with the purchasing department of the American Steel Foundries, Chicago, has resigned. In addition to his buying duties, he had charge of sales of reclaimable materials and discarded equipment. He has made no plans for the future.

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Aetna-Standard Company Acquires Steele Patent

The Aetna-Standard Engineering Co., Youngstown, has acquired exclusive control of the patent granted to Lawrence C. Steele covering the method of manufacturing metal sheets, known as the combination system. The Steele patent covers the method or process of operation, and the Aetna-Standard company, being the sole licensee, has the right to grant licenses to manufacture sheets and tin plate under this patent. In addition to the Steele patent, the Aetna-Standard company owns licenses upon mechanical catchers and other equipment under detail patents granted to the late Arthur R. McArthur.

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Local as well as national problems in steel construction will be given consideration at the ninth annual convention of the American Institute of Steel Construction, to be held at the Greenbrier Hotel, White Sulphur Springs, W. Va., Oct. 28 to 30. The convention will this year consume only three days instead of the full week heretofore devoted to it.

OBITUARY

ALFRED HENRY MULLIKEN, one of the founders and before his retirement in 1928 president of the Pettibone, Mulliken Co., Chicago, manufacturer of railroad supplies, died at his home in New Canaan, Conn., on Sept. 2, aged 77 years. Mr. Mulliken entered the railroad supply business with the Chicago firm of Crerar, Adams & Co., later joining with Asa G. Pettibone to form the firm of Pettibone & Mulliken. In 1885 the firm sold its jobbing business and began the manufacture of track hacks and rail benders under the name of the Pettibone, Mulliken Co. Mr. Mulliken served as secretary and treasurer of the company until 1899 when he bought out the holdings of his partner and became president. He disposed of his holdings in the company in 1928 and had lived in the East since that time. He was a director of the National Association of Manufacturers, the Continental-Illinois Bank of Chicago and of the Railway Business Association.

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HERMAN O. LANGE, president of the Ferguson & Lange Foundry Co., Chicago, died recently at his home in that city, aged 76 years. Mr. Lange was one of the founders of the company in 1896 and in 1915 he purchased the interest of his partner. He had been active in cost study work among foundries and was an active member of the American Foundrymen's Association and the Gray Iron Institute.

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C. W. PRICHARD, president, C. W. Prichard Co., Inc., used machinery dealer, died after a long illness at his home in Newark, N. J., on Sept. 2.

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HAROLD A. LINDAHL, vice-president of the Henry Lindahl Foundry & Machine Co., 5900 Ogden Avenue, Chicago, died at his home in that city on Sept. 1, aged 34 years.

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H. M. EASTON, New York district sales manager, Weirton Steel Co., Weirton, W. Va., and one of the company's oldest employees, died Sept. 3 at New Castle, Pa. He was 55 years old, and had been connected with the steel industry for the past 30 years.

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HERBERT G. COPP, Sr., director of purchases of Deere & Co., Moline, Ill., died at his home at Rock Island, Ill., from complications following a series of operations, on Sept. 2, aged 58 years. He was born at Rock Island and, after being graduated from the Rock Island High School, he entered Knox College. Upon leaving college, he engaged in the insurance business, and on April 1, 1895, he became identified with Deere & Co. as assistant to William Butterworth, then treasurer and purchasing agent. Mr. Copp continued in that capacity until the fall of 1907, when he was made purchasing agent. At the time of the reorganization of Deere & Co. in 1910, he was made director of purchases for all factories and branch houses, which position he held continously until his death.

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JAMES A. DAWES, who has been identified with the Pittsburgh Steel Co. in the sale of hoops and bands for 32 years, died at his home in Pittsburgh on Sept. 4.

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CHARLES RICHMOND DAY, formerly general manager of Pittsburgh Forge & Iron Co., Pittsburgh, died suddenly at the home of his son, Charles R. Day, Jr., at Ambridge, Pa., Sept. 5. He was born in Pittsburgh in 1872, but spent most of his early life in Philadelphia, and as a young man entered the employ of the old Midvale Steel & Ordnance Co., Nicetown, Philadelphia. With that company he acquired his knowledge of metallurgy and in 1909 became associated with the Pittsburgh Forge & Iron Co. as metallurgical engineer. He subsequently became general manager of this company and held this position until he retired about two years ago.

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Ohio Foundrymen Plan Safety Campaign

With State industrial insurance rates being boosted in two of the four foundry classifications, Ohio foundrymen are preparing to launch a six months' safety campaign to reduce accidents in an effort to regain the lower rate.

The campaign will begin Oct. 1 under auspices of the Ohio Foundries Association, of which Robert Hoierman is secretary, and the Ohio Department of Safety and Hygiene. A. H. Kramer, president, Advance Foundry Co., Dayton, has been named general chairman, with J. W. Beall, insurance commissioner of the Ohio Steel Foundry Co., Lima, as assistant general chairman.

The State is being divided into six districts with a vice-chairman in charge of each district organization. The vice-chairmen are Don McDaniel, Hamilton Foundry & Machine Co., Hamilton, Miami Valley district; J. W. Beall, Ohio Steel Foundry Co., western Ohio district; Fred Bennett, Buckeye Steel Casting Co., Columbus, central Ohio district; L. P. Henry, Maumee Malleable Casting Co., Toledo, northwest Ohio district; Ralph West, West Steel Casting Co., Cleveland, northeast Ohio district, and J. L. Wick, Jr., Falcon Bronze Co., Youngstown, eastern Ohio district.

Plans for the campaign were outlined shortly after the Ohio Industrial Commission announced a deficit of $706,796 in four of the foundry classifications, and increased the rates on two of these.

The deficits reported by the State are $376,889 for the iron foundry, $184,840 for steel casting, $98,915 for brass, bronze and aluminum, and $46,352 for malleable iron. The alloy metal class shows a surplus of $5,229.

The iron foundry rate was increased 25 per cent from $1.20 to $1.50 per $100 payroll and the non-ferrous rate was increased 33⅓ per cent from 90c. to $1.20. The steel casting rate of 60c. and the malleable iron rate of 70c. were not increased, in face of the deficit, in belief that an expected increase in business would automatically liquidate this deficit.

Reasons given by the State for these deficits are the increased benefits for employees under the State's new compensation code; decreased payroll; larger number of claims being filed and a larger number of accidents based on man hours.

Assurance has been given the foundrymen that a material reduction in accidents during the next 12 months will result in a reduced rate next year.

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Employment Gained in Cleveland in August

There was a gain of 1.7 per cent in employment in Cleveland in August, compared with July, as shown by the monthly survey of 100 plants conducted by the Cleveland Chamber of Commerce. Forty-two manufacturers in the metal-working group, including iron and steel makers and manufacturers of metal products outside of the automotive field, employed 13,392 persons on Aug. 31, compared with 13,168 on July 31, or a gain of 1.7 per cent.

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To Install Rolling Mill for Magnesium Sheets

Dow Chemical Co., Midland, Mich., has announced plans for a rolling mill and fabricating plant for Dowmetal or magnesium sheets. The mill will be erected on the site of the old No. 1 building at Midland, which is already being torn down. The structure will be of brick and steel construction 100 x 160 ft. and will contain approximately 20,000 sq. ft. of floor space. Equipment will consist of the rolling mill to be supplied by a Pittsburgh district builder, which will roll material up to 60 in. wide; a straightening machine, heat treating furnaces, etc. A 20-ton electric overhead crane will also be required.

Commodity Prices Below Cost Are Too Low

BY DR. LEWIS H. HANEY

DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

SOME of the outstanding price developments in August were the sharp decline in the Bradstreet general commodity price index to a new low, a moderate decline in THE IRON AGE composite of finished steel prices, further ease in pig iron prices, and a slight increase in the price of steel scrap. Obviously, the decline in general commodity prices has not yet been checked; consequently, hope for an early recovery in general business must be deferred. It is more apparent each month that we are on a permanently lower level of commodity prices.

Rise in the Bradstreet index in June and July was partly seasonal and partly a technical recovery stimulated by the moratorium proposal. But August brought new lows in prices for a number of raw materials, among which were cotton, rubber, copper and wheat. So long as a large group of raw materials continues to decline, no general stability is likely.

Our composite index of finished steel prices was lower in August, but the sharp decline in the Bradstreet index increased the spread between the price of finished steel and the price of the average commodity. Present steel quotations, however, are largely nominal, and do not represent prices which have been tested by active buying and selling; at least this appears to be true of bars and plates.

The July gain in price of heavy melting steel scrap did not carry through August. The average was higher at Pittsburgh, notwithstanding some reaction near the end of the month; Chicago averaged lower. The failure of scrap prices to show sustained strength through August, in which month scrap is normally the strongest of the year, does not give much basis for expecting a stronger steel price structure. Scrap prices, however, seem relatively low when compared with pig iron and steel prices.

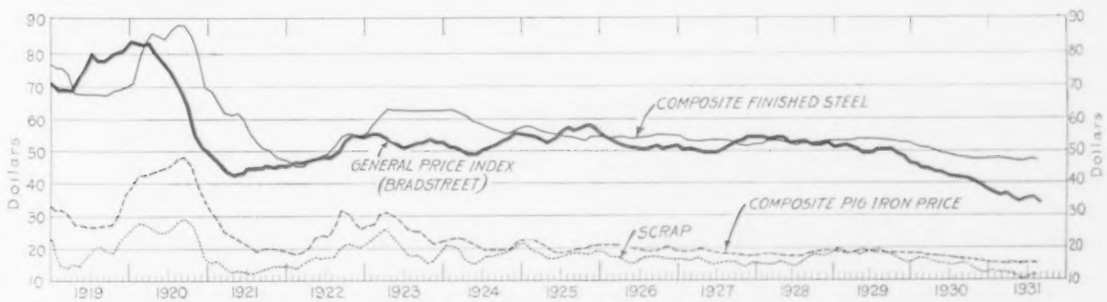
A further slight decline in pig iron prices in August brought the composite index to a new low. The decline in recent months has been gradual, and, if we go by precedent, the strength in scrap prices during the past two months might be followed by firmer pig iron prices. Other pig iron price barometers, also, suggest that the decline may be checked within another month or two.

There is no definite indication that the decline in general commodity prices is over. We know that some of the significant maladjustments have been reduced, but it will take more time before the readjustment is complete. Probably most of the well known price indexes will have shown a decline in August. This decline was not caused by a sharp break in one or two commodities, such as cotton and rubber, but has been broad. During every week in August, in a representative list, the number of commodities which declined outnumbered those which advanced.

Too many commodities are selling below the cost of production and many are below pre-war depression levels. Since prices have not stabilized, however, with production as far below normal now as it has been since 1921, we must conclude that either further curtailment of output is necessary, to bring early recovery, or production must remain subnormal for a longer period of time.

Many of the sentimental theories which have as their basis the idea of maintaining the past or even the present status must be abandoned, just as England is being compelled to cut the dole and other expenses. Maintenance of wages is commendable as evidence of humanitarian motives; but if high wages make for high costs and retard consumption, when consumer buying power is low, they may indirectly restrict employment.

Meanwhile, progress is slowly being made. Savings are accumulating and the buying power of each dollar saved is growing. Consumption industries are showing the effects of replacement demand, and tend to reassure as to the possible depths to which business might fall. Courageous steps have been taken to improve the international economic and financial situation, which should help to restore confidence and pave the way for a more normal interchange of goods.



There is further spread between the Bradstreet index of commodity prices and the average of finished steel prices. Heavy melting scrap at Pittsburgh was higher; at Chicago, lower. The average of pig iron prices dipped slightly more.

W. W. MACON
Editor

THE IRON AGE

A. I. FINDLEY
Editor Emeritus

(ESTABLISHED 1855)

Crisis in Workmen's Compensation

WORKMEN'S compensation is facing a crisis. In this time of extreme business depression, and because of the depression, cost to the employer, already high, has risen sharply. Year after year this item of overhead has been growing. In Massachusetts the increase in 13 years has been 273 per cent. On top of this, at a time when industry can least afford it, insurance rates will be increased all over the country. In Massachusetts alone the bill will be nearly if not quite $2,500,000 bigger. The blame is not placed upon the insurance companies, but upon the compensation laws themselves, and most particularly upon the boards which administer them.

Industry feels it is being imposed upon, that workmen's compensation, intended originally solely as accident insurance, was first evolved also to include health insurance, and now to be a form of unemployment insurance. The result is that some large manufacturing companies have already abandoned workmen's compensation and have returned to the old employers' liability acts, which the compensation laws were intended to replace for the best interest of the worker and of his employer as well. Other companies are considering similar action.

The increased insurance rate is not wholly due to the law itself. Premiums are based on the unit of $100 payroll, and with payroll reduced the rate must necessarily be higher. But another chief reason lies in the attitude of compensation boards, which refuse consistently to take into account the economic changes which have occurred in the past year or two. For instance, in Massachusetts, and doubtless in the other States, the practice had been established of taking back injured employees and giving them "easy" jobs for the period of rehabilitation. Nowadays such jobs are scarce. Therefore the compensation of such persons continues at its full figure, regardless of the effect of general business conditions on the earning capacity of workers. Again, if a man who has completely recovered from the effects of an industrial accident reports for work to his employer whose plant is shut down, the compensation board considers him, when thrown on the labor market, as "totally disabled." His full compensation goes on, regardless of the fact that his old fellow employees are without work or are on part time.

There seems to be no diminution of the now pretty universally established practice of these boards, as expressed in one of their decisions, that "this is a workmen's compensation act and supposes that the employee will be given compensation if there is *any* reason for making the award." Another decision favorable to a claimant was "possibly at some time he did something that *may* have caused the hernia." Attorneys have developed an amazingly ingenious technique in conducting the cases of applicants for compensation. The neurologist has been dragged in and his latest plea is typical. He contends that "traumatic neurosis" is a good cause for compensation. His meaning is not without its element of humor, for it is that an employee who has suffered injury and completely recovered physically from the effects of an accident should still be given compensation if he "believes" he cannot work.

The failure of the boards to distinguish between physical and mental ailments and economic disability in its industrial sense has resulted in compulsory physical examination of applicants for work and the strict enforcement of the rule that none but the truly physically fit shall be hired. In more ways than one, the abuse of workmen's compensation seems to be defeating the purpose for which it was created.

Will Meddlers See the Light?

IT is, perhaps, the consciousness of the rising demand for social services and the fear of accession to it, with the ruinous consequences that can be unerringly foreseen, that is holding us back from economic recovery in this country. This fear is illustrated in the actual hoarding of currency, equivalent to hoarding of gold, that is now estimated to be running to nearly a billion dollars in the aggregate.

It is rational to believe that the present depression in America may have begun as a naturally recurring undulation of minor order, but was prompted and prolonged by the socialistic medicines that were administered to cure it. Our economic body had previously been drugged gradually with the same kind of medicine during two decades. If the capitalistic system has failed to work as smoothly as formerly, it is owing to the mischief done by meddlers, who now blame the system, whereas they ought to blame themselves.

We cannot enjoy any prosperity, however, if we pursue the policy of pre-empting through taxation too much of the future earnings of some classes of people in order to satisfy the present desires of other classes, for that is what it means. It is not a liquidation and redistribution of what is called wealth, for that is mainly in lands and buildings and other physical things. The increased taxes that some seem doomed to pay are not going to come out of what they possess; but rather out of what they are

going to earn. The only part of our wealth that is available for feeding and clothing is in the stocks of goods and the gold for which all kinds of goods are always available by exchange.

This is why many persons are now hoarding gold, or rather the currency, most forms of which may be exchanged for gold upon demand. We think that the fears of such hoarders are foolish and that presently they will recover from their fears and resume investing and in one way or another will restore the currency to circulation. This will happen the sooner if the veterans, the wheat-growers, the cotton-planters, the leaders of organized labor, the philanthropists and the malcontents generally cease from frightening everybody with ideas of ghosts and forebodings of a graveyard.

We imagine if there develop more common sense in those quarters, the socialistic, progressive politicians would lose interest in the danse macabre that they have been doing during the last 10 years. There are too many persons thinking of an elysium that will turn out to be a potter's field if they persist in having their way and misguide the masses, who do not know whither the paths lead.

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Better Atmospheres for Heat Treating

IN the earlier days of heat treating, little or no attention was paid to the control of furnace atmospheres. In the coal-fired annealers the raw gas from the fuel with its oxidizing flame was allowed to impinge directly on the steel to be annealed. This was particularly true of steel castings. The resulting product was in many cases covered with a thick scale and often unevenly heated. Its cleaning was a serious and expensive problem. Sometimes the heat treatment was non-uniform and faulty.

Not so long ago the heat treatment of forgings and certain finished steel products was unsatisfactory owing to the fact that the furnace atmosphere was unsuited to the ends desired. The introduction of the electric heat-treating furnace and under certain conditions the gas-fired and oil-fired units overcame some of the faults of the coal-fired apparatus.

Engineers were soon confronted with the problem of controlling the atmosphere in all types of heat-treating furnaces. And it is now possible to reduce to a minimum the amount of scale by the use of non-oxidizing atmospheres of hydrogen, nitrogen, producer gas and the like. Little or no cleaning is necessary and even bright annealing of strip steel and non-ferrous products is achieved, with pickling eliminated in many cases. The development is an important factor in the production of rustless steel sheets and strip. Analysis of the relative costs is favorable to atmospheric control.

The certain, ultimate solution of the problem, announced by an article in this issue, is of large significance.

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FAILURE of a freight car axle last spring was traced to a built-up area at the journal fillet. It has been ascertained by the American Railway Association that such practice, using electric welding, causes a "transformation in structure with corresponding internal stresses at points in an axle where bending stresses of any magnitude occur, [which] will readily permit development of detail fractures." Such a detail fracture, extending over 90 per cent of the cross-section of the axle, was found to have preceded this wreck. Welding, excellent tool though it is when properly employed, cannot just be used in any old place in any old way.

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Good Old Days Not So Good

THE good old days prior to the stock market collapse were not altogether so good as men now fancy. For several months after the crash, the general idea was that it was the main thing that had occurred. Later it was pointed out that decline in industrial activity, after allowance for seasonal variation, had begun at just about July 1, 1929, four months earlier. Then the idea grew that it was a matter of business depression in a general cycle, and the stock market action was explained as having gone inordinately high even for the best of times and then having to take a double readjustment.

The idea held that the good old times were altogether good, except that somehow they did not carry within themselves the means of their perpetuation. Those times, however, were not really so perfectly good, even as a transient phenomenon, as is evidently thought by many. The distorted appraisals remind one of the man who, trudging unwillingly in his youth to school, conjures up visions in after years, when he has all sorts of pleasures, of those happy school days. As to the faulty notions of even those recent business times, let us quote from the leading editorial in THE IRON AGE of Jan. 31, 1929:

> The fact is, however, that for a long time the business situation has been unbalanced; that some lines have been discouragingly profitless while others have been marked by full demand. Coal mining has been unprofitable in nearly every year since the war. Textiles, lumber, leather, oil, fertilizers, and for eight years after the war copper, are typical of industries that have been unproductive, and at times depressed, over much of the period. And all the while agriculture has been in hard straits—an industry whose wellbeing has been considered indispensable to national prosperity.

What occurred was a general though far from extreme or well-balanced activity from late 1922 to the middle of 1928, with some short temporary dips, and then a special bulge during the 12 months to the middle of 1929, recession thereupon beginning. The bulge was not all right, for if it were why couldn't it have come sooner and lasted?

It is not helpful in this connection to exaggerate the goodness of the times from which we have fallen, nor is it encouraging to say that the old times cannot come back, as if they were simply too good for anything. Rather it will be well to hold the philosophy that they were not so very good after all, and that we have chances of getting eventually into better times than ever.

▲▲▲ CORRESPONDENCE ▲▲▲

Jonesburg Has a Depression

To the Editor: Jonesburg was the thriving seat of Jones County. A fire destroyed half of the property in the city. The citizens threw up their hands in despair and said, "It will take 50 years to replace what was destroyed and in the meantime we must get along on a much lower standard of living, denying ourselves of all except the barest necessities." But some of the less pessimistic members of the community said, "No, we'll find the culprit and make him pay." Finally some of the members of the Glutzburg fire department were apprehended, charged with arson and convicted, and the city of Glutzburg was forced to promise repayment of the damage done to Jonesburg.

But Glutzburg itself had had a disastrous fire and could not hope to pay its debt to Jonesburg before several generations had passed.

So the outlook remained gloomy until some enterprising makers of bicycles, harmonicas and high hats made a discovery. By putting in better machinery and adopting improved methods these crafty craftsmen found that cycling, harmonica harmony and high hatting, previously the exclusive prerogatives of the wealthy, could be brought within the reach of the middle classes.

The profit per bicycle, mouth organ or top hat was much smaller than before, but was multiplied so many times that the total profits of the plants mounted. A boom ensued. Instead of passing the swelling profits back to the public in the form of lower prices, new plants were built and old ones were expanded. Finally the point was reached when it became difficult to sell any more bicycles, harmonicas or high hats. "Well, there are still a lot of people we haven't sold," said the manufacturers, "and we must make it possible for them to buy, even if we have to lend them the money. You know we can't continue to make large total profits unless we have volume." So they went to the poor and took their orders, permitting them to pay in "easy" payments.

The bicycle, hat and mouth organ business got better than ever and everybody got the itch to get in on the profits. So promoters went to the manufacturers and said: "You ought to refinance. In other words, you ought to recapitalize on the basis of present earnings and sell your stock to the public." Each share was thereupon cut up into five parts and a sixth part was added which was divided between the promoter and the manufacturers. People borrowed from money lenders to buy the stock, in many cases putting up as collateral other shares that they had purchased. They bought the shares not for the earnings, which at the prevailing prices of the stock were small, but in the expectation that share values would continue to rise and yield a handsome profit.

Some of the money lenders frowned on this type of activity, calling it "inflation," but the interest that borrowers were willing to pay was too good a thing for most lenders to pass up. They justified their policy by declaring that times had changed, that a "new era" of mass production and unending prosperity had arrived. The mad scramble for shares continued, and almost every day the Jonesburg *Intelligencer* would carry headlines like the following:

"High Hat Is Higher"; "Harmonica Has Stronger Tone"; "Bicycle Passes Former Mark."

Then some enterprising men decided that it would be a good idea to sell machinery for making high hats, bicycles and mouth organs to plants in other cities. So they went to Chauncyville, Camemberta, Garlica and Glutzburg and sold machinery. They didn't get money for the machinery—at least, not directly. Those cities also had had fires. In addition, Glutzburg was obligated to pay the cost of all the fires, it having been discovered that the same group of Glutzburg fire fighters that started the Jonesburg conflagration had been responsible for the other fires.

Well, the Jonesburg money lenders lent money to all of these cities to buy machinery, being confident that they would be amply repaid from the large profits that would come from setting the equipment to work on a mass production basis.

So far so good. Finally the Jonesburg plants found that they could not sell any more goods. Every Tom, Dick and Harry had a high hat, a mouth organ and a bicycle. In some cases it was found possible to sell two or even three bicycles to one person, but not very often. So the earnings of the plants fell off. People no longer bought stock in the hope of making a profit on its further rise. As plant operations declined men were put out of work. They had to sell their stock. Soon every one was selling stock and prices dropped so low that they did not cover the amount of money that the money lenders had lent on the shares. Then the money lenders unloaded to realize what they could and that depressed prices all the more.

And since Jonesburg people were no longer making money they could not buy goods from other towns. So men were put out of work everywhere and the money lenders in Jonesburg began to have trouble getting interest on their loans to other cities.

The time came when there was a serious Glutzburg crisis. The Glutzburgers, it developed, had used a large part of the money lent them to make payments against the fire damage in Jonesburg and other towns. They said frankly: "We have worked hard, but we haven't been able to earn enough above living expenses to reduce our indebtedness. We have more unemployed than you and, since Jonesburg and other towns won't buy from us, our situation is hopeless. We're getting tired of being perpetual debtors. And, what is more, we refuse to admit that our fire department was alone responsible for starting all those fires."

Well, another town, called Spinach-on-Chinsk, had repudiated a lot of old debts to other cities and had got away with it. So the Jonesburg money lenders were afraid that the Glutzburgers might do the same thing. Finally the mayor of Jonesburg said: "All right, you Glutzburgers, I guess you are up against it, temporarily anyhow. So we will call off all payments for a year. Maybe by that time business will be better."

But business in Jonesburg got worse and worse. More and more people were put out of their jobs. And those remaining at work had their pay cut. The money lenders said, "We've got to save the dividends or as large a part of them as we can." But others said: "How about all these factories? They can't make money unless the masses can buy their output. What you ought to do is to lend more money to the plants so that they can lower their costs. Better equipment will cut operating expenses even if business volume is subnormal. The only sure way of creating a social surplus to wipe out our present deficits is by using the machine to multiply the efforts of man."

Some of the money lenders said: "Bosh, the machine got us into the present trouble. It has produced more goods than we know what to do with." They failed to mention the part that share speculation had played in

(*Concluded on page* 722)

Crackless Plasticity, a New Property of Metals

(*Concluded from page* 677)

ly increased the amount of energy which could be absorbed before a crack-starting stress was developed.

The experiments of R. R. Moore[8] showed that under repeated-stress tests specimens with a screw thread, turned some distance along the specimen, showed a distinctly higher endurance limit than did specimens turned with a single groove the depth and shape of a screw thread (See Fig. 7). Similar results have been obtained in *impact* tests at the University of Illinois and the University of Wisconsin.[9] Specimens such as are shown in Fig. 8 are tested in an impact tension test. The energy absorbed for specimen (a) is much less than that for either specimen (b) or specimen (c). This indication of a similarity of results obtained in service, in repeated stress tests, and in impact tests seems worthy of further study.

In conclusion the writer wishes to emphasize the fact that there seems to be a property of metals, which is neither strength nor ductility as shown by a tension test, and which seems to be important—namely, the ability to resist fairly large numbers of loads which cause very slight plastic action, without starting a crack. He has suggested the term "crackless plasticity" to denote this property. There have been suggested methods of experimental study of this property including fatigue tests following a period of overstress, notched-bar impact tests and tests of the damping of vibrations in the metal.

Even though nearly all this article consists of suggestions rather than of test data already obtained, the writer believes that this problem of the fragility or crackless plasticity of metal is important enough to be called to the attention of experimenters and users of metals, even though nothing further than suggestions can be made at this time.

[8] *Proceedings*, A.S.T.M., Vol. 26, Part II, page 255 (1926).

[9] These tests have been demonstration tests for students, conducted by Professor M. O. Withey at Wisconsin and by the writer at Illinois.

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Heat Treating, Forging and Melting with Electricity

(*Concluded from page* 683)

counterflow furnaces of the pusher type with alternate rows of boxes moving in opposite directions. One of these furnaces is shown in Fig. 11. The hearth is approximately 61 ft. long, 3½ ft. high and 9 ft. wide, with a connected load of 310 kw. Ring gear forgings are normalized in electric furnaces, one of which is shown in Fig. 9. After normalizing, the gears are machined. The gears, now ready for carburizing, are packed in round sheet alloy boxes with a chimney through the center. The boxes are loaded in an upright position by a chain fall and hooks on to alloy trays for pushing through the furnace. Each tunnel holds 35 boxes and discharges a box every 16 min., giving a total of 90 boxes, or a gross weight of 27,000 lb. per tunnel in 24 hr. This amounts to about 15 lb. gross per kwhr. when operating at 1750 deg. F., to produce a case of 0.048 to 0.052 in.

Model A drive pinions are carburized in a four-chamber counterflow furnace, similar to the one used for ring gears, except that there is a separating wall down the middle making, in reality, two furnaces which can be operated independently. Rectangular sheet alloy boxes are pushed through in an upright position. This furnace produces 12,000 pinions in 24 hr.

After carburizing ring gears are hardened in a vertical, semi-continuous electric furnace (Fig. 12). This furnace has a heating chamber 2½ ft. in diameter and 4 ft. high, with a connected load of 60 kw. The operator stands on a platform about 2 ft. above the floor level and charges one gear at a time through a horizontal slot near the bottom of the furnace. As the gear is pushed into the furnace, it is supported and centered by three fingers equally placed around the periphery of the gear.

After it is centered an elevating plunger, motor-driven, with a platform on top, rises automatically to support the gear as the fingers are withdrawn. This plunger raises the gear through a height approximately the thickness of the gear, when the supporting fingers come into action again to support the gear while the plunger is withdrawn, to permit the introduction of another gear.

This process is repeated until a stack of gears almost as high as the chamber is accumulated. When the top gear comes opposite a slot near the top of the furnace, a door automatically opens and one gear is manually withdrawn to be quenched in oil in a quenching press. This furnace produces 30 gears an hour at the rate of about 8 lb. per kwhr.

(*To be concluded*)

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Heat Treatment Assures Dependable Gears

(*Concluded from page* 687)

ing operation, or the program control of heat treating. Special number designations indicate the first operation in the hardening department or the refining treatment previously mentioned as the plant's second operation. This may be represented by

100 pieces.....	1000-1
100 pieces.....	1000-2
Up to 100 pieces.....	1000-9

Next come the machining operations required before final hardening, followed by the final hardening, designated possibly as:

100 pieces.....	1000-1-1
100 pieces.....	1000-2-1
Up to 100 pieces.....	1000-9-1

Modifications of the general system are possible and often resorted to, depending on the number of pieces from a heat and so on. There must always be an equivalent test piece, even if an extra product piece has to be selected. Such a program of control makes it possible to identify the exact stage in the process of production, the composition of the piece

and its history at any time whether during manufacture or while in service.

It is claimed that, while such a system of control involves much labor and attention to detail, the results have been fully justified not only in checking the heat-treating and machining operations in the plant, but in tracing defective work and thus correcting manufacturing mistakes.

Although it has been stated that the use of hardness tests to judge machineability does not give definite results, it should be stated, says Mr. Smith, that knowledge of Brinell, scleroscope and Rockwell hardness numbers of material will be found advantageous if the numbers are within demonstrated limits of the metallurgical condition best suited to broaching, planning and similar operations. In many plants this is the most economical and practical method of testing machineability.

Nothing has been said about the more recent development of hardening gears by nitriding. It can be stated, however, that this process has excellent possibilities in its application to gears. While its use in this field is largely in the experimental stage, prospects that the results will be advantageous and that it will become of general use are excellent.

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Heat Treatment and Magnetic Analysis

(*Concluded from page* 689)

After the patenting operation the wire should have a sorbitic structure, as shown in photomicrograph Fig. 6. When wire of this structure is compared with wire of the pearlitic structure the curve, as shown in Fig. 7, was obtained. Lengths of patented wire were then run through the magnetic apparatus against a pearlitic wire standard. If the heat treatment and response to the heat treatment were correct, the curve remained substantially that of Fig. 7. In several places, however, the curve changed to that of Fig. 5. When these places were checked microscopically they showed a pearlitic structure similar to that shown in photomicrograph Fig. 4.

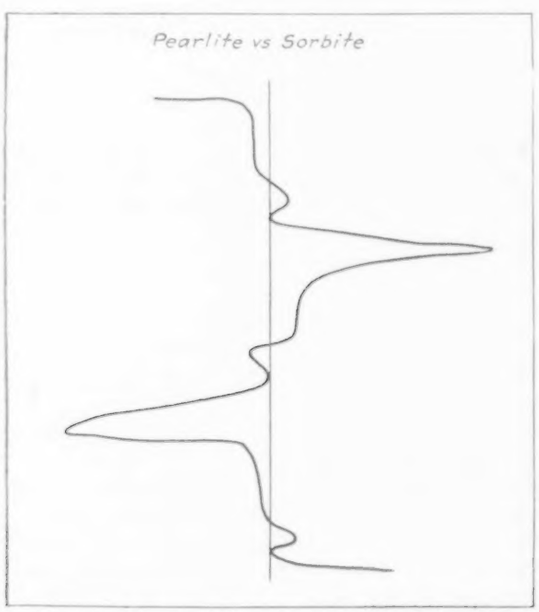

FIG. 7.—Oscillograph of wire having the structure of Fig. 6 compared with wire of the pearlitic structure.

Other instances might be cited where magnetic analysis is being used as an inspection or aid in heat treating, such as the detection of incipient burning in butt-welded tubing, the detection of heat-treating cracks and so forth, but enough has been shown by the illustrations and the explanations given above to bring out the possibilities of magnetic analysis in connection with heat treatment.

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Jonesburg Has a Depression

(*Concluded from page* 720)

bringing about the wide disparity between productive capacity and consuming power.

Other money lenders said nothing, but simply smiled. The biggest ones still had plenty of coin of the realm and knew that when prices got low enough they would have enough money to buy every last plant in Jonesburg and probably in Glutzburg and a lot of other towns besides. Hadn't the foundations for all great fortunes been laid during depressions? Of course, they did not say what they expected to do with the plants after they owned them. Maybe they will turn them into art museums, or perchance into "speakeasies"—the only form of business that is still half-way active.

But what about the unemployed? "Let the unemployed take care of themselves," the money lenders said. "They are paying the penalty of presumption and improvidence. They must get back to the old virtues of saving and thrift. They had no right to sport bicycles and harmonicas. And as for high hatting, they simply were not born for that high estate. They must return to plain living."

"You surely can't let them starve," others said. "You must either try the principles of management and engineering in an effort to revive plant activity or give the workless unemployment benefits."

"Whoever heard of curing a disease caused by machinery by administering more machinery?" the money lenders retorted indignantly. "And as for the miserable dole, it would keep business indefinitely in the doldrums. See what has happened to Chauncyville."

JONUS JONES.

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STEEL production shows up much better in comparison with 1921 than generally apprehended. So far this year there has been an engagement of 42 per cent of capacity; for all of 1921, operations averaged 37 per cent. According to the long time trend, consumption should have required 71 per cent operations instead of the 42. Yet, as it is, the tonnage for the eight months of the year is equal to the total for all of 1921. What has helped to eradicate profits this year is an average selling price $8.15 under that obtaining in 1921, a heavy difference to be balanced even against the large reductions in manufacturing costs made meanwhile.

Steel Production Dips But Specifications Show Slight Gain

RELEASES from Ford and General Motors Help Mills —Ingot Output Declines to 30 Per Cent—Scrap Advances at Pittsburgh

THE passing of Labor Day, which marks the end of the summer vacation period, has had the usual effect of injecting renewed vigor into iron and steel sales programs. While it would be an exaggeration to say that any marked betterment in demand is expected to result from a more concerted drive for business, the industry is at least more cheerful, viewing such favorable indications as there are with satisfaction and awaiting further developments with hope.

While August was a disappointment, in that it failed to give any cue as to fall business prospects, it was nevertheless reassuring in that it showed that both production and prices have struck resistance levels. Steel ingot output varied but little throughout the month and registered the smallest decline from a previous month since the inception of the current recession last April. The record since the first of September likewise suggests that bottom has been plumbed so far as production is concerned. Although adversely affected by Labor Day curtailment, present ingot output averages about 30 per cent and before the week end may again equal or possibly exceed the 31 per cent rate of a week ago.

PRICES have held rather evenly since the first of August. There have been a few additional readjustments in pig iron, including one in the current week which brings THE IRON AGE composite price down to $15.42 a ton, a new low since October, 1915, but ruling quotations in most market centers remained unchanged. Finished steel prices have been generally firm throughout this period. Scrap lost some further ground, but this has been partially recovered by an advance this week at Pittsburgh, which raises THE IRON AGE scrap composite from $9.08 a ton, the low for the depression, to $9.17 a ton.

EVIDENCES of improved demand, although still too fragmentary to be regarded as conclusive, include a slight gain in releases from the automobile industry, the appearance of several rail inquiries, a heavier flow of public works requirements in structural steel and reinforcing bars and more active consumption by a number of miscellaneous industries, among them radio, stove and steel barrel manufacturers.

The Ford company placed steel orders to balance stocks for the production of 50,000 or more assemblies of its present model before going over to a new car. Subsidiaries of the General Motors Corpn. ordered steel for new models to be brought out late in the year. The Chrysler and Hudson companies have issued inquiries for steel for fourth quarter which are expected to provide a severe test for current prices on bars, strip steel and sheets. While estimates of automobile output for this month have been revised upward from 160,000 to 180,000 units, substantial gains in steel requirements are not expected to be felt until later in the year, when manufacturers start producing new models to stock their dealers. Orders for equipment necessitated by impending model changes are giving a new stimulus to machine tool output. Following recent purchases by the Chevrolet company, now estimated as totaling close to $1,000,000, the Lycoming Mfg. Co., an Auburn subsidiary, has placed orders amounting to $400,000.

STRUCTURAL steel awards, at 41,000 tons, are well above the average, although falling far short of the total of 76,000 tons of a week ago. New fabricating projects, aggregating 37,000 tons, include two Federal buildings at Washington, each of which calls for 10,000 tons. Many pending jobs are approaching the contracting stage. On the Pacific Coast alone work likely to be placed this month calls for a total of 46,000 tons. In Illinois the award of considerable concrete bar and structural steel tonnage is expected to follow the apparent settlement of a controversy over the State's "standard" wage law.

RAIL inquiries include 8200 tons for the Delaware & Hudson and 10,000 to 30,000 tons for the Boston & Maine. The Pennsylvania is expected to come into the market for 150,000 tons.

Current prices on wire products, sheets and strip steel have been reaffirmed for fourth quarter. Bolts, nuts and large rivets lack the stability shown by most mill products. Bolt and nut discounts continue irregular and prices on large rivets have been reduced $5 a ton to $2.50 per 100 lb., Pittsburgh or Cleveland.

PITTSBURGH

Steel Production in District Now at the Low Point of the 1921 Depression

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PITTSBURGH, Sept. 8.—Except for slight improvement in the demand from the automotive industry incident to the production of new models and the fact that the Ford Motor Co. has resumed production on its Model A cars and is taking a little steel to try out the dies for its forthcoming new model, there has been no betterment in the general steel demand nor in the rate of steel ingot production.

Because of the holiday interruption it is doubtful if ingot output is more than 25 per cent of capacity. For a comparable rate it is necessary to go back to Fourth of July week in 1921. Conditions resulting in the low rate then, however, are much different than those responsible for the present low ebb. Then the consuming industry was working off excessive stocks, while today there are no stocks but a lack of buying power.

It is perhaps because of a lack of sizable stocks in consumers' hands that a strong feeling of hope exists in the trade for improvement in the near future. The passing of Labor Day, which marks the end of the vacation period, may be responsible for some of this hopefulness, since really tangible prospects are not much in evidence. Possibly the trade also is beginning to become reconciled to the fact that emergence from the depression is more likely through natural developments than through the several plans which have been proposed as a rapid way out. There would be a good deal of home building if it was merely the cost of the building materials that had to be reckoned on, but whatever benefit the home-builder might derive from this situation is defeated by the attitude of the banks in regard to small loans, and especially on real estate.

Recent activity in scrap, it transpires, carried the market on heavy melting grade somewhat higher than was indicated a week ago, and for the fifth month in succession railroad scrap offerings again brought an advance over the previous month. The rise in this raw material, however, seems to lack permanence because steel works operations are so low and there are so few real signs of improvement in the demand for finished steel.

The finished steel market is holding well as to prices, but, as has been true for some time past, this condition is explained by a lack of selling pressure and by the fact that inquiries are so small as to offer no real test.

Steel ingot rate for district at about 25 per cent, lowest since early July, 1921.

* * *

Only improvement in demand is from the automobile industry, and that is not large.

* * *

Smallness of consumers' stocks and passing of Labor Day raise hopes for some betterment soon.

* * *

Scrap market shows a little strength, but gain in steel making is needed to give it definite upward trend.

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PIG IRON

Possibly the shipments on old orders are a little more numerous than they have been recently, in keeping with a slight pick-up in foundry operations, but the market still is very quiet. No inquiries of importance are before the producers. There is no indication that prices will be higher in the immediate future and, consequently, no disposition on the part of melters to buy more than their actual needs. Non-integrated steel makers appear to be well supplied with iron. If any considerable part of the business on which they have quoted develops into actual orders, the steel foundries should need more iron. More residential and hotel building seems necessary to provide sanitary ware manufacturers enough business to need more iron. Foundries in this district engaged in that line are not running more than three single turns a week. Prices are unchanged, but they are predicated on single car lots, raising a question as to what might be done on a worth-while tonnage.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$15.50 to $16.00
Bessemer	17.00
Gray forge	16.50
No. 2 foundry	17.00
No. 3 foundry	16.50
Malleable	17.00
Low phos., copper free	26.66 to 27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$16.00 to $16.50
No. 2 foundry	17.50
No. 3 foundry	17.00
Malleable	17.50
Bessemer	17.50

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

SEMI-FINISHED STEEL

Billets, slabs and sheet bars remain quotable on spot shipment tonnages at $29, Pittsburgh, and Youngstown, and at that price f.o.b. Cleveland on billets and slabs. Not much information is available as to contract prices, but it is believed they are somewhat under that figure. In keeping with the low rate of strip and sheet mill operations and a downward trend in tin mill engagements, releases on contracts are light. Off-grade billets are going fairly steadily; these are available at concessions from prices of specification steel. Wire rods still wait upon improvement in the demand for bolts and other products made from them.

TUBULAR GOODS

Makers are pretty well through with line pipe orders and, with no new ones of consequence coming out, operation of mills used in making that class of pipe is very low. The latest word in reference to the Stanolind line is that it has been referred back to Chicago. It was supposed that this line would tap the east Texas field, but now it is not definitely known which of the Southwestern fields it will enter. Ordinarly there is some demand by this time for standard pipe for heating and other building work, but as yet such demand amounts to little. Another fortnight, however, is expected to see some definite improvement. Oil country pipe has not gained in demand and inquiries from the automotive industry remain few and small. The market as a whole is dull, but there is a good measure of firmness to prices.

SHEETS

As a result of releases by the Ford Motor Co. and specifications by some of the General Motors subsidiaries, there is a little more activity in automobile sheets than has been the case recently. The releases by the former indicate a continuance of the production of the Model A cars. Orders from the General Motors Corpn. are for steel for new models to come out late this year. There is a very fair demand for the common finishes, with buyers finding efforts to secure price concessions futile. They are buying only as the needs arise, but producers are taking full advantage of the condition that all inquiries represent real requirements and that the orders will be forthcoming as promptly at full prices as they would if the prices were shaded. Mill operations are holding at about the recent rate, or between 30 and 35 per cent of capacity.

TIN PLATE

There is usually some recession in releases at this time of the year, with

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Sept.8, 1931	Sept.1, 1931	Aug.11, 1931	Sept.9, 1930
No. 2 fdy., Philadelphia	*$16.26*	$16.76	$16.76	$19.76
No. 2, Valley furnace	17.00	17.00	17.00	18.00
No. 2 Southern, Cincinnati	14.69	14.69	14.69	15.69
No. 2, Birmingham	12.00	12.00	12.00	14.00
No. 2 foundry, Chicago*	17.50	17.50	17.50	17.50
Basic, del'd eastern Pa.	16.75	16.75	16.75	18.75
Basic, Valley furnace	15.50	15.50	15.50	18.00
Valley Bessemer, del'd P'gh	18.76	18.76	18.76	20.26
Malleable, Chicago*	17.50	17.50	17.50	17.50
Malleable, Valley	17.00	17.00	17.00	18.50
L. S. charcoal, Chicago	25.04	25.04	25.04	27.04
Ferromanganese, seab'd carlots	†$85.00	†$85.00	†$85.00	94.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

†Ferromanganese quotations adjusted to carload unit; larger quantities at discounts.

Rail, Billets, etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	34.00	34.00	34.00	36.00
Rerolling billets, Pittsburgh	29.00	29.00	29.00	31.00
Sheet bars, Pittsburgh	29.00	29.00	29.00	31.00
Slabs, Pittsburgh	29.00	29.00	29.00	31.00
Forging billets, Pittsburgh	35.00	35.00	35.00	36.00
Wire rods, Pittsburgh	35.00	35.00	35.00	36.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.60	1.60	1.60	1.70

Finished Steel, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.60	1.60	1.60	1.60
Bars, Chicago	1.70	1.70	1.70	1.70
Bars, Cleveland	1.65	1.65	1.65	1.70
Bars, New York	1.93	1.93	1.93	1.93
Tank plates, Pittsburgh	1.60	1.60	1.60	1.60
Tank plates, Chicago	1.70	1.70	1.70	1.70
Tank plates, New York	1.88	1.88	1.88	1.88
Structural shapes, Pittsburgh	1.60	1.60	1.60	1.60
Structural shapes, Chicago	1.70	1.70	1.70	1.70
Structural shapes, New York	1.85½	1.85½	1.85½	1.80½
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	2.10
Hot-rolled strips, Pittsburgh	1.55	1.55	1.55	1.65
Cold-rolled strips, Pittsburgh	2.15	2.15	2.15	2.35

Finished Steel, *Per Lb. to Large Buyers:*	Sept.8, 1931 Cents	Sept.1, 1931 Cents	Aug.11, 1931 Cents	Sept.9, 1930 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.40	2.40	2.40	2.40
Hot-rolled annealed sheets, No. 24, Chicago dist. mill	2.50	2.50	2.50	2.50
Sheets, galv., No. 24, P'gh	2.90	2.90	2.90	3.00
Sheets, galv., No. 24, Chicago dist. mill	3.00	3.00	3.00	3.10
Hot-rolled sheets, No. 10, Pittsburgh	1.70	1.70	1.70	...
Hot-rolled sheets, No. 10, Chicago dist. mill	1.80	1.80	1.80	...
Wire nails, Pittsburgh	1.90	1.90	1.90	2.00
Wire nails, Chicago dist. mill	1.95	1.95	1.95	2.10
Plain wire, Pittsburgh	2.20	2.20	2.20	2.30
Plain wire, Chicago dist. mill	2.25	2.25	2.25	2.35
Barbed wire, galv., Pittsburgh	2.55	2.55	2.55	2.70
Barbed wire, galv., Chicago dist. mill	2.60	2.60	2.60	2.85
Tin plate, 100-lb. box, P'gh	$5.00	$5.00	$5.00	$5.25

Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	*$10.75*	$10.50	$10.75	$15.75
Heavy melting steel, Phila.	8.50	8.50	8.75	13.00
Heavy melting steel, Ch'go	8.25	8.25	8.25	12.50
Carwheels, Chicago	9.50	9.50	10.00	13.50
Carwheels, Philadelphia	12.00	12.00	12.00	15.00
No. 1 cast, Pittsburgh	11.00	11.00	11.00	13.50
No. 1 cast, Philadelphia	11.50	11.50	11.50	13.00
No. 1 cast, Ch'go (net ton)	8.50	8.50	9.00	11.50
No. 1 RR. wrot., Phila.	10.00	10.00	10.00	15.00
No. 1 RR. wrot., Ch'go (net)	7.00	7.00	7.00	10.00

Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.40	$2.40	$2.40	$2.60
Foundry coke, prompt	3.50	3.50	3.50	3.50

Metals, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Lake copper, New York	7.87½	7.87½	8.12½	11.12½
Electrolytic copper, refinery	7.25	7.25	7.25	10.50
Tin (Straits), New York	25.62½	26.75	25.12½	29.87½
Zinc, East St. Louis	3.80	3.80	3.82½	4.30
Zinc, New York	4.15	4.15	4.17½	4.65
Lead, St. Louis	4.22½	4.22½	4.22½	5.35
Lead, New York	4.40	4.40	4.40	5.50
Antimony (Asiatic), N. Y.	6.60	6.60	6.60	7.75

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

an attendant decline in mill operations; this year is no exception to the rule. Estimates of operations range from 45 to 50 per cent of capacity, but the average is a little nearer the lower than the higher figure. Tin plate has made a relatively good showing this year, with shipments 20 per cent or less behind those of the same period last year, against losses in other products of from 30 to 40 per cent.

STRIPS

There is an increasing tendency among makers of cold-rolled strips to exact an extra price for small lots. On sizable lots or to customers whose annual takings amount to something, the price is 2.15c., base, but for small lots 2.25c. is rather generally quoted. Total business over the past five weeks in both hot and cold-rolled strips has registered some gain over the July record, but the market is far from active, and makers are not expecting much improvement until later in the month, when, it is believed, the motor car builders will be more liberal buyers.

BOLTS, NUTS AND RIVETS

Demand for nuts and bolts, particularly from the motor car industry, is so slack that production at the rate of about 25 per cent of capacity is sufficient to meet requirements. The discount of 73 and 10 per cent off list is fairly closely observed. Prices of large rivets have been lowered $5 a ton and now are quoted at $2.50, base Pittsburgh and Cleveland, and $2.60, base Chicago or Birmingham. Slow demand has been accompanied by some price concessions and the regular quotations have been lowered to meet these cuts. Small rivets remain unchanged at 70, 10 and 5 off list.

COLD-FINISHED STEEL BARS

Resumption by the Ford Motor Co. has helped business slightly, but the market is still quiet, and is notable more for the firmness of prices than for the volume of orders.

WIRE PRODUCTS

Business in finished products—nails, barbed wire and staples—has improved some in the past week, incident to the opening of books for fourth quarter at unchanged prices, and the necessity of specifying on old contracts taken at lower prices. Wire has benefited some from the resumption of production by the Ford Motor Co. of its Model A car. It would be an exaggeration to call the market active, but there is a very firm mill market despite some secondary price irregularity.

BARS, PLATES AND SHAPES

On the general run of day-to-day business the market is holding well at 1.60c., base Pittsburgh. Structural lettings in this area remain very light, and projects on which local fabricators are working are in almost all cases public rather than private ventures. The national picture on structural steel construction is much brighter than the local one.

COKE AND COAL

The demand holds up rather well for foundry coke and also for heating coke, but there is no improvement in the call for the furnace grade. The

THE IRON AGE COMPOSITE PRICES

	Finished Steel	Pig Iron	Steel Scrap
Sept. 8, 1931	2.116c. a Lb.	$15.42 a Gross Ton	$9.17 a Gross Ton
One week ago	2.116c.	15.50	9.08
One month ago	2.116c.	15.50	9.25
One year ago	2.142c.	16.88	13.75
	Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.
	High — Low	High — Low	High — Low
1931	2.142c., Jan. 13; 2.102c., June 2	$15.90, Jan. 6; $15.42, Sept. 8	$11.33, Jan. 6; $9.08, June 23
1930	2.362c., Jan. 7; 2.121c., Dec. 9	18.21, Jan. 7; 15.90, Dec. 16	15.00, Feb. 18; 11.25, Dec. 9
1929	2.412c., April 2; 2.362c., Oct. 29	18.71, May 14; 18.21, Dec. 17	17.58, Jan. 29; 14.08, Dec. 3
1928	2.391c., Dec. 11; 2.314c., Jan. 3	18.59, Nov. 27; 17.04, July 24	16.50, Dec. 31; 13.08, July 2
1927	2.453c., Jan. 4; 2.293c., Oct. 25	19.71, Jan. 4; 17.54, Nov. 1	15.25, Jan. 11; 13.08, Nov. 22
1926	2.453c., Jan. 5; 2.403c., May 18	21.54, Jan. 5; 19.46, July 13	17.25, Jan. 5; 14.00, June 1
1925	2.560c., Jan. 6; 2.396c., Aug. 18	22.50, Jan. 13; 18.96, July 7	20.83, Jan. 13; 15.08, May 5

coal market is dull. Aside from a subnormal demand for coal for industrial and railroad requirements, the weather is too mild to stimulate the demand for coal for household use. Prices are holding fairly well.

OLD MATERIAL

More complete details of recent activity in the steel works grades disclose that one company, which recently increased its active steel-making units, paid up to $11.50 for railroad heavy melting steel, and as much as $11 for compressed sheet scrap. These prices appear to be well above the general market, although on heavy melting grade the price is well substantiated on the most recent awards of the Pennsylvania Railroad, which is understood to have obtained around $11.35 to $11.40 for such material. This road is reported to have withdrawn the scrap rails and splice bars from its most recent offering. Offerings of scrap rails are very limited, and prices are somewhat out of the usual relation with heavy melting grade.

Outside of the mill which bought at the higher prices, there has been no important business in heavy melting steel at more than $10.50 to $10.75, and a range of $10.50 to $11 is probably more representative of the present possibilities than would be a spread extending to $11.50. The market is bound to have brief periods of comparative strength from time to time, but the trade in general does not expect a prolonged upswing until there is a definite betterment in business and a marked brightening in the prospects.

There are 5640 gross tons in the September scrap list of the Baltimore & Ohio Railroad, and the Norfolk & Western is offering 3150 net tons.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$10.50 to $11.00
No. 2 heavy melting steel	9.75 to 10.25
Scrap rails	10.75 to 11.25
Compressed sheet steel	10.50 to 11.00
Bundled sheets, sides and ends	9.50 to 10.00
Cast iron carwheels	10.50 to 11.00
Sheet bar crops, ordinary	11.00 to 11.50
Heavy breakable cast	8.00 to 8.50
No. 2 railroad wrought	10.25 to 10.75
Hvy. steel axle turnings	9.50 to 10.00
Machine shop turnings	7.00 to 7.50
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	12.75 to 13.25
Railr. coil and leaf springs	12.75 to 13.25
Rolled steel wheels	12.75 to 13.25
Low phos. billet and bloom ends	14.50 to 15.00
Low phos. mill plates	12.50 to 13.00
Low phos. light grades	12.50 to 13.00
Low phos. sheet bar crops	13.50 to 14.00
Heavy steel axle turnings	9.50 to 10.00
Electric Furnace Grades:	
Low phos. punchings	13.50 to 14.00
Heavy steel axle turnings	9.50 to 10.00
Blast Furnace Grades:	
Short shoveling steel turnings	7.50 to 8.00
Short mixed borings and turnings	7.50 to 8.00
Cast iron borings	7.50 to 8.00
Rolling Mill Grades:	
Steel car axles	16.50 to 17.50
Cupola Grades:	
No. 1 cast	10.50 to 11.00
Rails 3 ft. and under	12.50 to 13.00

Warehouse Prices, f.o.b. Pittsburgh

	*Base per Lb.
Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.60c.
Reinforcing steel bars	2.60c.
Cold-finished and screw stock—	
Rounds and hexagons	3.10c.
Squares and flats	3.60c.
Bands	2.95c.
Hoops	3.95c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.05c.
Galv. sheets (No. 24), 25 or more bundles	3.40c.
Hot-rolled sheets (No. 10)	3.15c.
Galv. corrug. sheets (No. 28), per square (less than 3750 lb.)	3.74c.
Spikes, large	2.50c.
Small	2.75c. to 2.90c.
Boat	3.00c.
Track bolts, all sizes, per 100 count,	70 and 10 per cent off list
Machine bolts, 100 count,	70 and 10 per cent off list
Carriage bolts, 100 count,	70 and 10 per cent off list
Nuts, all styles, 100 count,	70 and 10 per cent off list
Large rivets, base per 100 lb	$3.20
Wire, black, soft ann'l'd, base per 100 lb.	2.30
Wire, galv. soft, base per 100 lb	2.75
Common wire nails, per keg	2.05
Cement coated nails, per keg	2.05

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

Sheet & Tube Passes Common Dividend

YOUNGSTOWN, Sept. 8.—Breaking a continuous dividend-paying record of 25 years, the Youngstown Sheet & Tube Co. today voted to omit third quarter dividends on common stock, due Oct. 1. The board, however, approved a quarterly disbursement of $1.37½ on preferred stock, payable Oct. 1 to holders on record Sept. 20. The dividend omission today emphasizes the effects of the prolonged depression on the iron and steel industry. In March, this year, the company reduced its common dividend to a $4 a year basis, and in June to a $2 rate. No profits applicable to common stock were earned in the last quarter of 1930, nor in the first two quarters of this year.

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Stock varieties of chasers for self-opening and adjustable die heads have been reduced in number approximately 75 per cent, according to estimates of the National Bureau of Standards' division of simplified practice. Recommendation No. 51-29 of the division, which was instrumental in effecting this reduction, has been reaffirmed without charge for another year by the standing committee of the industry.

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Orders for shelving furniture in July reported to the Bureau of the Census by 16 manufacturers were valued at $328,371, against $451,875 in June. In the first seven months of 1931 and 1930 they were valued at $2,969,087 and $5,595,173, respectively.

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Sales of babbitt metal in July totaled 1,420,265 lb., according to reports received from 43 manufacturers by the Bureau of the Census. Sales in June were 1,605,009 lb. Production in July declined to 1,931,685 lb. from 2,306,940 lb. in June.

CHICAGO

Holiday Cuts Into Steel Production But Pick-Up Is Expected This Week

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Influenced by the holiday, steel production is off slightly, compared with a week ago.

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Steel specifications showed an almost imperceptible improvement in first week of September.

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There are still expectations that seasonal improvement will be felt soon.

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Prices will be generally reaffirmed for the fourth quarter.

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Scrap market continues in dull state, with little movement in prices.

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CHICAGO Sept. 8.—Aggregate specifications for finished steel products last week showed an almost imperceptible improvement over the August average with some companies. With others there was no noticeable change. While it is too early this week to get an estimate of releases, producers have been given many promises of expanded requirements and are confident that at least a seasonal upturn will begin to be felt.

New buying has been negligible, but a little fourth quarter inquiry for sheets, track accessories, strip steel and bars has begun to appear. A portion of this inquiry has come from the automobile industry, which is the only large consuming group which shows definite signs of life next month. Reports from the implement trade are still vague, and there is no promise of buying by the railroads even after a decision on the plea for increased freight rates is made.

Apparent settlement of the wage dispute, which has been holding up State highway work in Illinois, will bring awards on a considerable tonnage of reinforcing bars and structural steel during the week unless further legal obstacles are offered. However, it is too late in the season for much of this tonnage to reach mills this year.

As had been anticipated, steel ingot production in the district was adversely affected by the week-end holiday and fell well under the 30 per cent rate that has prevailed for some time. By the end of the week the leading interest expects to have regained lost ground and the independent will show similar gains. Steel works blast furnace operations are unchanged, while finishing mill output was responsive to the trend in raw steel production and will be resumed in about the same ratio.

Prices are receiving more attention as the time for fourth quarter contracting approaches. Present quotations on wire and nails will be reaffirmed during the week, and it is generally assumed that there will be no change on sheets and strip steel. Mills have avoided making quotations on the heavy hot-rolled products, but no change from the present quoted schedules seems likely.

PIG IRON

Inquiry for pig iron showed some improvement last week, and sellers are more hopeful than they have been for several weeks. Shipments have not changed, but there are indications that gains will be registered this week. New buying is very light. Prices are fairly well maintained on both Northern and Southern foundry iron. A sale of 500 tons of Southern iron last week brought the full price of $11, Birmingham. Little boat iron is being sold, and the market is largely untested. The silvery grade is weak because of the competition between Jackson County and Buffalo furnaces. No activity in charcoal iron is reported.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$17.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	18.00
Malleable, not over 2.25 sil.	17.50
High phosphorus	17.50
Lake Super. charcoal, sil. 1.50	$25.04 to 27.04
S'th'n No. 2 fdy.	17.01
Low phos. sil. 1 to 2, copper free	28.50 to 29.20
Silvery, sil. 8 per cent	24.79 to 26.79
Bess. ferrosilicon, 14-15 per cent	35.79

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnaces, not including an average switching charge of 61c. per gross ton.

FERROALLOYS

With no improvement in steel plant operations, demand for ferroalloys is still very depressed. Shipments are low, and no buying is reported to offer a test of prices.

STRIP STEEL

A small amount of four quarter inquiry has appeared, but current specifications continue to be very light. Although no official announcement has been made, the present quotations of 1.65c. and 1.75c., Chicago, on hot-rolled strip and 2.15c. to 2.25c., Cleveland, on cold-rolled, probably will be reaffirmed.

BARS

Occasional fourth quarter inquiries for mild steel bars are reaching the mills, but no quotations are yet being made. Current releases are very light, although increases in the requirements of a few automobile manufacturers are reported. No demand from the implement trade has developed. Mills are occupied at about 35 per cent of capacity. Rail steel bars are going to the manufacturing trade at about the rate which prevailed during August and production is maintained at 40 to 45 per cent of capacity. Little test of prices is offered in the present market.

RAILS AND TRACK SUPPLIES

Rail releases were small again last week, amounting only to about 2000 tons. New buying has been negligible. Chicago makers are unable to confirm a report that a large Eastern carrier may soon come into the market for its 1932 requirements. Specifications for accessories are holding at recent levels. One or two buyers have come into the market for their fourth quarter requirements, but will not close before the end of the month.

CAST IRON PIPE

With inquiries fairly numerous and awards maintaining the recent average, cast iron pipe business promises to give a fairly good account of itself this month. Muskegon, Mich., has placed 20,000 ft. of 6-in. and 5000 ft. of 10-in. pipe with the McWane Cast Iron Pipe Co. and 4500 ft. of 12-in. with the Alabama Pipe Co. Milwaukee will take bids Sept. 15 on 1960 tons of 24, 36, 48 and 54-in., Class C water pipe, including 1767 tons of plain material, 133 tons of lugged and 60 tons of special castings. Prices are well maintained at $33 to $35 a ton, Birmingham, for pipe 6-in. and larger.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $41 to $43; 4-in., $44 to $46; Class A and gas pipe, $3 extra.

WIRE PRODUCTS

The character of demand showed no change in the last week, and movement of manufacturers' wire continues to make a somewhat better showing than merchant products. Jobbers in the agricultural districts are not yet disposed to place orders, but some improvement is expected before the end of the month. It is understood that present quotations of 2.25c., Chicago district mill, on manufacturers' wire,

and $1.95 a 100-lb. keg on nails will be reaffirmed for fourth quarter.

SHEETS

Specifications during the last week have been very light, and practically no new business is reported. However, many consumers are known to have exhausted their supplies taken during July at the old prices, and fourth quarter buying is expected to get under way earlier than usual. Some inquiry has appeared, on which makers are quoting the prices which have been in effect since July 1. Demand for culvert stock may show some improvement following the release of considerable road work in Illinois which had been held up by wage controversies. Mill operations have been slightly lower because of the Labor Day holiday, but are expected to be back in a day or two to about the rate which has prevailed for several weeks.

Base prices per lb., deliv'd from mill in Chicago: No. 24 hot-rolled annealed, 2.55c.; No. 24 galv., 3.05c.; No. 10 hot-rolled, 1.85c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

BOLTS, NUTS AND RIVETS

No gain in specifications has appeared. Fourth quarter inquiry is still negligible. Many consumers who ordinarily buy in carloads are only taking mixed carload lots and diverting business to manufacturers of highly diversified lines. Prices on bolts and nuts are weak, but rivets are well maintained.

WAREHOUSE BUSINESS

Sales of steel products out of warehouse have been light in the last week, and jobbers expect little improvement before the middle of the month. No change in prices is reported. Current quotations appear to be well maintained on the small orders being taken.

REINFORCING BARS

Apparent settlement of the wage controversy, which has held up award of about $11,000,000 worth of State highway work in Illinois, has given the reinforcing bar market a more active tone. Bids will be taken during the week on several hundred tons of bars required in various localities. While this material is not likely to be shipped this year, it will add materially to mill backlogs. The Chicago Post Office reinforcing bars are expected to be awarded at any time. General contracts will be let next week on two Sanitary District jobs, requiring 3700 tons. Not much new inquiry is appearing, but the volume of pending work is large. Prices continue weak, with billet steel bars quotable at 1.55c. to 1.60c., a lb. and rail steel bars for building purposes at 1.25c. to 1.35c.

PLATES

The average rate of specifications is unchanged. Little new inquiry is appearing. Two railroads have asked for prices on their fourth quarter requirements, but will not place the business until late in the month. Tank work in the east Texas oil fields calls for 1000 to 1300 tons of plates. The price is fairly well maintained at 1.70c., Chicago district mill.

STRUCTURAL MATERIAL

With the Chicago Post Office placed, interest is centered on a bridge across the Mississippi River, near New Orleans, which will take a large tonnage and on which bids will be taken Sept. 15. Awards during the week have been small, but have been numerous enough to make a rather satisfactory aggregate tonnage. A Post Office at Little Rock, Ark., took 1200 tons. Settlement of the Illinois highway wage controversy will revive considerable bridge work in the State, including several structures over the Illinois-Mississippi Canal, which will take about 4000 tons of structural steel. Recent activity in fabricating shops is being maintained and would be fairly satisfactory if more jobs of 100 tons or less were included. Steel for the Chicago Post Office will be rolled at the rate of about 1000 tons a week and work will probably be begun this fall.

COKE

A little improvement in demand for foundry coke is noticed, but gains in shipments are limited. The domestic grade is still dull, with the normal movement which might be expected at this time of the year held up by credit difficulties being experienced by dealers.

OLD MATERIAL

The scrap market has been especially quiet in the last week from the standpoint of new orders, although shipments against old contracts have been maintained. No sales of heavy melting steel are reported, and the price remains quotable at $8 to $8.50. While some negotiations for boat shipments of this material to Lake Erie consuming points have been underway, no definite arrangements have been made. Blast furnace scrap is still being bought for water shipment, and, in view of the scarcity of this grade, prices are strong. There is little demand for the foundry grades, and prices are nominal. Specialties are particularly dull.

Prices del'd Chicago dist. consumers:

	Per Gross Ton	
Basic Open-Hearth Grades:		
Heavy melting steel	$8.00 to	$8.50
Shoveling steel	8.00 to	8.50
Frogs, switches and guards, cut apart, and misc. rails	8.00 to	8.50
Factory hyd. comp. sheets	6.50 to	7.00
Drop forge flashings	6.00 to	6.50
No. 1 busheling	6.00 to	6.50
Forg'd cast and r'l'd steel carwheels	8.50 to	9.50
Railroad tires, charg. box size	10.50 to	11.00
Railroad leaf springs cut apart	10.25 to	10.75
Axle turnings	6.75 to	7.25
Acid Open-Hearth Grades:		
Steel couplers and knuckles	9.00 to	9.50
Coil springs	10.50 to	11.00
Electric Furnace Grades:		
Axle turnings	7.25 to	7.75
Low phos. punchings	11.00 to	11.50
Low phos. plates, 12 in. and under	10.50 to	11.00
Blast Furnace Grades:		
Cast iron borings	4.25 to	4.75
Short shoveling turnings	4.25 to	4.75
Machine shop turnings	4.25 to	4.75
Rolling Mill Grades:		
Rerolling rails	10.00 to	10.50
Cupola Grades:		
Steel rails, less than 3 ft.	10.25 to	10.75
Steel rails, less than 2 ft.	11.00 to	11.50
Angle bars, steel	9.25 to	9.75
Cast iron carwheels	9.50 to	10.00
Malleable Grades:		
Railroad	7.50 to	8.00
Agricultural	7.50 to	8.00
Miscellaneous:		
*Relaying rails, 56 to 60 lb.	19.00 to	21.00
*Relaying rails, 65 lb. and heavier	22.00 to	27.00
	Per Net Ton	
Rolling Mill Grades:		
Iron angle and splice bars	8.50 to	9.00
Iron arch bars and transoms	9.00 to	9.50
Iron car axles	15.50 to	16.50
Steel car axles	12.00 to	12.50
No. 1 railroad wrought	7.00 to	7.50
No. 2 railroad wrought	7.00 to	7.50
No. 1 busheling	5.50 to	6.00
No. 2 busheling	4.00 to	4.50
Locomotive tires, smooth	11.50 to	12.50
Pipes and flues	5.50 to	6.00
Cupola Grades:		
No. 1 machinery cast	8.50 to	9.00
No. 1 railroad cast	7.00 to	7.50
No. 1 agricultural cast	7.00 to	7.50
Stove plate	6.25 to	6.75
Grate bars	5.50 to	6.00
Brake shoes	5.75 to	6.25

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

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Orders for steel furniture in the business group in July were valued at $1,092,118, against $1,272,098 in June, according to reports received by the Bureau of the Census from 36 producers. In the first seven months of 1931 orders were valued at $9,899,867, compared with $15,666,102 in the corresponding period of last year.

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New York section of the American Institute of Mining and Metallurgical Engineers will celebrate its twentieth anniversary with a cruise on the Hudson River on Tuesday, Sept. 15.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	2.75c.
Reinforcing bars, billet steel	1.55c. to 2.00c.
Rail steel reinforcement—	
For buildings	1.25c. to 1.55c.
Highway slabs	1.50c.
For bridges and culverts	1.65c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.10c.
Flats and squares	3.60c.
Bands, $\frac{1}{4}$ in. (in Nos. 10 and 12 gages)	2.95c.
Hoops (No. 14 gage and lighter)	3.50c.
Hot-rolled annealed sheets (No. 24)	3.55c.
Galv. sheets (No. 24)	4.10c.
Hot-rolled sheets (No. 10)	3.20c.
Spikes ($\frac{1}{2}$ in. and larger)	3.45c.
Track bolts	4.30c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
	Per Cent Off List
Machine bolts	73
Carriage bolts	73
Coach and lag screws	73
Hot-pressed nuts, sq., tap. or blank	73
Hot-pressed nuts, hex., tap. or blank	73
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	2.30
Cement c't'd nails, base per keg	2.30

CLEVELAND

A Slight Improvement Occurs in Steel Orders and Operations

CLEVELAND, Sept. 8.—The first week in September brought a slight gain in the demand for the heavier rolled steel products. While orders were more plentiful than during August, all were for small lots.

Steel plant operations in Cleveland again increased slightly this week by the putting on of one open-hearth furnace. Local plants are now operating 11 open-hearth furnaces, or 32 per cent of ingot capacity, compared with a minimum of 20 per cent early in August. However, one plant is stocking ingots which it is now producing in excess of the demands of its finishing mills.

A slight gain in releases is reported by some of the makers of automobile parts. Recent buying of sheets and strip steel by the automotive industry has been restricted to fill-in orders and there is nothing to indicate a material increase in the demand from this source this month. Operations of most metal-working plants are still sharply restricted. While improvement is looked for this fall, there is as yet little evidence of a turn for the better. Builders of road machinery are still very busy, but a seasonal slackening in the demand for this equipment is expected shortly. Shops that cater to the automobile tire industry are fairly busy.

The only development of interest in the price situation is the announcement by some of the mills that present prices on sheets and hot and cold-rolled strip will be continued through the fourth quarter. Prices generally are being well maintained.

IRON ORE

Ore shipments from the Lake Superior district during August showed a slight gain, having been 5,064,687 tons, compared with 4,956,061 tons in July. August shipments were 3,187,012 tons less than during the corresponding month last year. The total movement until Sept. 1 was 15,774,007 tons, a decrease of 16,801,914 tons, or 51.58 per cent, compared with the same period last year. September shipments are expected to fall below those of August.

PIG IRON

Shipments have started somewhat better this month, particularly to the motor car industry, which is expected to take more iron this month than in August. Sales and inquiries continue light, although one producer sold 3000 tons in small lots during the week. Foundries as a rule are buying only for their early needs. Operations by gray iron jobbing foundries in this territory show no improvement. Many of these foundries are working only one or two days a week. Prices are being maintained at $16 to $17, Lake furnace, for foundry and malleable iron for Ohio and Indiana shipment, $17 to $17.50 for Michigan, and $17, Cleveland, for local delivery. There are still reports of price concessions for shipment to some outside points to overcome freight disadvantage.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$17.00
S'th'n fdy., sil. 1.75 to 2.25	17.01
Malleable	17.50
Ohio silvery, 8 per cent	25.00
Stand. low phos., Valley	27.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; $3 from Jackson, Ohio; $6.01 from Birmingham.

BARS, PLATES AND SHAPES

Orders are a little more numerous than recently, but are only for small lots for immediate needs. The improvement is largely in bars. Little inquiry is coming from the building field for structural steel. Some good business in reinforcing bars is pending. The Ohio Highway Department has asked for bids for a bridge at Bedford requiring 800 to 900 tons of bars. The Nine Mile Creek culvert job, Cleveland, requiring 2000 tons, will be readvertised, bids having been rejected. A Cleveland contractor is low bidder for the Pymaluming dam, Jamestown, Pa., which will require a round tonnage of reinforcing bars and 900 tons of sheet steel piling. The market is well stabilized at 1.65c., Cleveland, for steel bars for local shipment and outside delivery and 1.60c., Pittsburgh, for plates and shapes.

SHEETS

Present prices have been reaffirmed for the fourth quarter on all grades by one leading maker, and other mills are expected to follow suit. The announcement of the price reestablishment is expected to remove some uncertainty as to the maintenance of the present quotations. While mills evidently have adhered firmly to these prices, some buyers were not convinced that the market had been sufficiently tested to give assurance that shading would not develop. Some round-lot business for September was placed by the barrel industry during the week, but otherwise the local market was very slow. Quite a fair tonnage in fill-in orders has come from the motor car industry during the past two weeks, which has enabled some of the mills to increase operations this week.

STRIP STEEL

One or two mills have reaffirmed present prices for the fourth quarter and others probably will take similar action. The ruling prices of 1.55c., Pittsburgh, for wide strip, 1.65c. for narrow and 2.15c., Cleveland, for cold-rolled strip are being well maintained. Demand continues light. Consumers are keeping stocks very low, are buying only in small lots, and usually insist on quick shipments.

BOLTS, NUTS AND RIVETS

In spite of efforts to stabilize the bolt and nut market at the regular 73 and 10 per cent discount, concessions of an additional 5 or 10 per cent are still appearing in some cases. Demand continues very slow from the three larger consuming industries—the automotive, railroad, and makers of agricultural machinery—and jobbers also are buying very sparingly.

OLD MATERIAL

Movement of scrap has been further restricted by the shutting off of shipments, except on shoveling steel, for an indefinite period by one Valley consumer. Shipments to Cleveland mills are limited to blast furnace scrap that is being taken by one consumer. Dealers are paying $7.50 for shoveling steel for Valley delivery. Other grades are lifeless. While prices are unchanged, doubt is expressed that they will remain at present levels unless the demand improves before the end of the month.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$8.50 to $9.00
No. 2 heavy melting steel	7.50 to 8.00
Compressed sheet steel	7.50 to 7.75
Light bundled sheet stampings	6.50 to 7.00
Drop forge flashings	6.75 to 7.00
Machine-shop turnings	5.00 to 5.50
Short shoveling turnings	6.50 to 7.00
No. 1 railroad wrought	9.50 to 10.00
No. 2 railroad wrought	10.00 to 10.50
No. 1 busheling	6.75 to 7.00
Pipes and flues	5.50 to 6.00
Steel axle turnings	7.50 to 8.00
Acid Open-Hearth Grades:	
Low phos., billet bloom and slab crops	14.00 to 14.50
Blast Furnace Grades:	
Cast iron borings	6.50 to 6.75
Mixed borings and short turnings	6.50 to 6.75
No. 2 busheling	6.00 to 6.25
Cupola Grades:	
No. 1 cast	10.00 to 10.50
Railroad grate bars	6.00 to 6.50
Stove plate	6.00 to 6.50
Rails under 3 ft.	15.00 to 15.50
Miscellaneous:	
Rails for rolling	13.00 to 13.50
Railroad malleable	11.00 to 11.25

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes	2.95c.
Soft steel bars	2.75c.
Reinforc. steel bars	1.75c. to 1.95c.
Cold-fin. rounds and hex	3.10c.
Cold-fin. flats and sq.	3.60c.
Hoops and bands, No. 12 to ¼ in., inclusive	3.00c.
Hoops and bands, No. 13 and lighter	3.55c.
Cold-finished strip	*5.55c.
Hot-rolled annealed sheets (No. 24)	3.60c.
Galvanized sheets (No. 24)	4.00c.
Hot-rolled sheets (No. 10)	3.00c.
No. 9 ann'l'd wire, per 100 lb	$2.25
No. 9 galv. wire, per 100 lb	2.70
Com. wire nails, base per keg	2.10

*Net base, including boxing and cutting to length.

NEW YORK

Dullness Still Characterizes Pig and Steel Demands

NEW YORK, Sept. 8.—Pig iron purchases are still limited to small lots for quick shipment. Total sales, at 3000 tons, compare with 6000 tons in the previous week and 4500 tons two weeks ago. There are no sizable inquiries pending, but a number of buyers may come into the market in a larger way later in the month. This is particularly true of melters who wish to place orders for barge iron so that deliveries can be made before the season of navigation on the State canals closes. The placing of most of this prospective tonnage, however, is contingent on an improvement in general business conditions. Pig iron and coke shipments are reported better in some directions, but the gain has not been sufficient to indicate any real change in the average rate of melt.

Barge rates from Buffalo have stiffened lately because of an increase in grain traffic, but the rates are still so variable as to make it difficult for pig iron sellers to quote on shipments for forward delivery. Pig iron prices generally are still highly competitive and show no material change aside from somewhat lower delivered quotations on eastern Pennsylvania iron.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$19.41 to $19.91
*Buff. No. 2, del'd east. N. J.	17.78 to 18.28
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	16.89 to 17.39
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	17.89 to 18.39

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.
*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

FINISHED STEEL

The second week of September opened with the steel market still laboring under the midsummer dullness that has marked business for many weeks. Steel company sales offices are unable to detect even an undercurrent of improvement, but are still hopeful that at least slightly better business will develop in the near future. Whatever betterment develops, however, must come from miscellaneous sources because none of the important consuming channels promises anything outstanding in tonnage. The week-end holidays seem to have had an effect on structural steel inquiries and lettings, which are in small number this week. The formal contract for 23,000 tons of steel for the Parcel Post Building, New York, has been given to the McClintic-Marshall Corpn. Otherwise, there have been no awards of size.

With the period for fourth quarter contracting close at hand, the mills are giving attention to prices, and it now appears that all of the prevailing quotations will be reaffirmed for the final three months of the year. Manufacturers of wire and nails have already taken such action, and present sheet and strip prices probably will be reestablished this week. Sheet mills have been much encouraged by the firm manner in which the new prices have held, although the real test will come with the making of new contracts.

CAST IRON PIPE

Fresh inquiry for pressure pipe continues to be light. The only new project reported requires 600 tons of various sizes for a water system at Tupper Lake, N. Y. Award of 1000 tons of small sizes for Rocky Hill, Conn., is expected to be made this week. Warren Foundry & Pipe Corpn. took several contracts involving 2000 tons of 36-in. pipe for a New Jersey public utility and 500 tons for several Brooklyn utility interests. Yonkers, N. Y., purchased 500 tons of 12-in. from United States Pipe & Foundry Co. Material for the Racquette Lake, N. Y., water distribution system, requiring 200 tons, will be furnished by American Cast Iron Pipe Co.; previous report of award to Central Foundry Co. was incorrect.

Prices per net ton delivered New York: Water pipe, 6-in. and larger, $32.90; 4-in. and 5-in., $35.90; 3-in., $42.90. Class A and gas pipe, $3 extra.

OLD MATERIAL

The market is affected by the usual holiday lull, and about the only movement of scrap on contracts is No. 1 steel to Coatesville, Pa., at $8.50, delivered, and by barge to Buffalo at $6.25, on barge in New York harbor. A small tonnage of No. 2 steel and machine shop turnings is moving to the consumer at Phoenixville, Pa. While there is no real shortage of scrap, dealers are preparing a considerably smaller quantity at the present price levels.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$5.00 to $6.25
Heavy melting steel (yard)	3.00 to 3.50
No. 1 hvy. breakable cast.	6.50 to 7.00
Stove plate (steel works)	4.00
Locomotive grate bars	4.00
Machine shop turnings	2.00 to 2.50
Short shoveling turnings	2.50
Cast borings (blast fur. or steel works)	2.50 to 3.00
Mixed borings and turnings	2.00
Steel car axles	12.75 to 13.00
Iron car axles	15.00 to 15.50
Iron and steel pipe (1 in. dia., not under 2 ft. long)	5.50 to 6.00
Forge fire	4.50
No. 1 railroad wrought	8.25
No. 1 yard wrought, long	7.25
Rails for rolling	6.25 to 6.75
Stove plate (foundry)	4.75 to 5.50
Malleable cast (railroad)	6.50 to 7.00
Cast borings (chemical)	8.00 to 8.50

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	$10.00 to $10.50
No. 1 hvy. cast (columns, bldg. materials, etc.: cupola size)	8.00 to 8.50
No. 2 cast (radiators, cast boilers, etc.)	7.00 to 7.50

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Total sales by 582 plants engaged primarily in making stamped and enameled ware amounted to $192,670,000 in 1929, of which 52½ per cent, or $101,059,000, were made to users, such as manufacturers of automobiles, stoves, etc., bottlers, etc., according to data of the Census of Distribution.

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Albert Pipe Supply Co., Berry and North Thirteenth Street, Brooklyn, has bought the entire stock of the McDowell Pipe Corpn., Brooklyn, consisting of about 3000 tons of new black and galvanized pipe, in sizes from ½ in. to 24 in. in diameter. The purchase also includes the McDowell pipe shop.

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Sales in 1929 by 199 plants engaged primarily in making engines, turbines, tractors or water wheels totaled $449,836,000, of which 71.8 per cent represented sales to distributers and to manufacturers' own sales branches, according to the Census of Distribution.

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Kempsmith Mfg. Co., Milwaukee, has issued a new catalog which fully describes its cone-type milling machine which has been strengthened throughout, especially in the gibbing, into which there has been incorporated the former Maximiller design.

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and struc. shapes	2.70c. to 3.10c.
Soft steel bars, small shapes	2.70c. to 3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. scrap, soft and quarter hard	4.95c.
Hoops	3.75c.
Bands	3.40c.
Hot-rolled sheets (No. 10)	3.00c. to 3.25c.
Hot-rolled ann'l'd sheets (No. 24*)	3.50c.
Galvanized sheets (No. 24*)	4.00c.
Long terne sheets (No. 24)	5.00c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel,	4.50c. to 7.00c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

	Per Cent Off List
Machine bolts, cut thread:	
¾ x 6 in. and smaller	65 to 65 and 10
1 x 30 in. and smaller	65 to 65 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	65 to 65 and 10
¾ x 20 in. and smaller	65 to 65 and 10
Boiler Tubes:	Per 100 Ft.
Lap welded, 2-in.	$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

PHILADELPHIA

Pig Iron Off 50c. a Ton—Two Inquiries for Rails

PHILADELPHIA, Sept. 8.—Steel mill operations are unchanged at slightly under 30 per cent of capacity, and the volume of new business has been reduced by the usual holiday lull. Prices, however, are being maintained, mills showing no inclination to shade on the current type of business, made up chiefly of less-carload lots. Sheet consumers are buying only small tonnages of material, but some fair business is in prospect for ventilating ducts required in new buildings.

Inquiries for rails are beginning to appear, and include 8200 tons for the Delaware & Hudson Railroad and a quantity for the Boston & Maine, estimated at 10,000 to 30,000 tons. Formal inquiry for 1932 rail requirements of the Pennsylvania has not been issued, but it is estimated that they will not be more than 150,000 tons.

Fabricating shops are bidding on a number of small contracts, including certain private projects, such as a factory in Philadelphia for the Consolidated Cigar Corpn., a branch for Swift & Co. at Wilkes-Barre, Pa., and an apartment building in Jenkintown, Pa. The Department of Justice Building in Washington, which requires 10,000 tons of structural steel and 600 tons of sheet piling, will have foundations of concrete-filled pipe, for which 3500 tons of 12¾-in. steel pipe will be used.

PIG IRON

Although business from eastern Pennsylvania consumers of foundry iron is mostly in carload lots, competition is keen, and the more desirable orders have recently brought out concessions to $15.50 a ton, base. Meanwhile, Southern furnaces are maintaining $11, Birmingham, for foundry iron, which is not competitive at the present level in eastern Pennsylvania. The steel company blast furnace at Swedeland is expected to blow out by the end of this month, which will leave only the furnaces at Bethlehem, Pa., still active in eastern Pennsylvania.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$16.26 to $16.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	16.76 to 17.26
East. Pa. No. 1X	17.26 to 17.76
Basic (del'd east. Pa.)	16.75
Malleable	19.00 to 20.00
Stand. low phos. (f.o.b. east. Pa. furnace)	23.00 to 24.00
Cop. b'r'g low phos. (f.o.b. furnace)	22.00 to 23.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.04
Va. No. 2, 2.25 to 2.75 sil.	22.54

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

STEEL BARS

Buying is small. The price is firm at 1.60c., Pittsburgh, or 1.89c., Philadelphia. Billet steel reinforcing bars are unchanged at 1.60c., Pittsburgh, or 1.89c., Philadelphia, subject to concessions of $1 and $2 a ton on the larger projects. Most of the present inquiry for reinforcing bars specifies only small lots, usually under a carload. Rail steel bars range from 1.20c. to 1.30c., Pittsburgh, or 1.49c. to 1.59c., Philadelphia.

SHAPES

Mill operations are unchanged. Prices are held at 1.70c., f.o.b., nearest mill to consumer, or 1.76c., Philadelphia, on most orders. On occasional large lots of shapes, concessions of $1 a ton are not unusual. Fabricators are in need of more contracts, but are bidding on a number of small private projects in addition to the sizable volume of public work in the market.

PLATES

Orders are small, with prices generally maintained at 1.70c., Coatesville, Pa., or 1.80½c., Philadelphia. Operating rates of plate mills in this district range from about 25 per cent to 30 per cent. Except for the steel for 11 destroyers to be built by the Navy Department, mills are bidding only on small lots of plates, usually under a carload.

SHEETS

Consumers have booked some small contracts for execution this fall and are expected to be in the market before long for sheets. In addition to about 250 tons of galvanized material for ventilating ducts in the Philadelphia Savings Fund Building, the new Pennsylvania terminal is expected to require a substantial tonnage of sheets for the same purpose. Of the three leading radio manufacturers in this district, one is producing 7500 sets a day, an increase of about 3000 sets from the previous rate and close to capacity. The other two manufacturers, however, are still at low rates of production. Sheet prices are unchanged on the new bases and have not yet been subjected to a real test by a sizable purchase.

IMPORTS

In the week ended Sept. 5, 6650 tons of iron ore arrived at this port from Algeria and 458 tons of pig iron was received from British India.

OLD MATERIAL

Prices are unchanged. Business is limited to shipments by brokers against contracts and sales of distress carloads of various grades. No. 1 heavy melting steel is moving to Coatesville, Pa., and in occasional carloads to the consumer at Bethlehem, Pa.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$8.00 to $9.00
No. 2 heavy melting steel	7.00
No. 1 railroad wrought	10.00 to 10.50
Bundled sheets (for steel works)	6.50
Hydraulic compressed, new	7.00 to 8.00
Hydraulic compressed, old	6.00 to 7.00
Machine shop turnings (for steel works)	5.50 to 6.00
Heavy axle turnings (or equiv.)	8.00 to 8.50
Cast borings (for steel works and roll. mill)	5.50 to 6.00
Heavy breakable cast (for steel works)	10.50
Railroad grate bars	7.50 to 7.75
Stove plate (for steel works)	7.50 to 7.75
No. 1 low phos., hvy. (0.04% and under)	12.00 to 13.00
Couplers and knuckles	11.00
Rolled steel wheels	11.00
No. 1 blast furnace	5.50
Wrot. iron and soft steel pipe and tubes (new specific.)	10.50 to 11.00
Shafting	15.00 to 15.50
Steel axles	16.00 to 16.50
No. 1 forge fire	8.00 to 8.50
Cast iron carwheels	12.00 to 12.50
No. 1 cast	11.00 to 11.50
Cast borings (for chem. plant)	11.50 to 12.00
Steel rails for rolling	10.50

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.50c.
Structural shapes	2.50c.
Soft steel bars, small shapes, iron bars (except bands)	2.60c.
Reinforc. steel bars, sq., twisted and deform.	2.30c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.15c.
Steel bands, No. 12 to ⅛-in. inclu.	2.90c.
Spring steel	5.00c.
Hot rolled, box annealed sheets (No. 24)	3.55c.
Galvanized sheets (No. 24)	4.00c.
Hot rolled blue annealed sheets (No. 10)	3.05c.
Diam. pat. floor plates, ¼-in.	5.20c.
Swedish iron bars	6.60c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

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Dardelet Threadlock Corpn., New York, has licensed the National Acme Co., Cleveland and Windsor, Vt., to manufacture, use and sell bolts, nuts and screw machine products threaded with the Dardelet self-locking screw thread.

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Page Steel & Wire Co., Bridgeport, Conn., is opening a Southeastern district sales office at 1520 Healey Building, Atlanta, Ga., in charge of R. J. Teeple, who has been head of the chain link fence division for the past three years.

CINCINNATI

Rush Shipments Characterize Pig Iron Demand—Scrap Weak

CINCINNATI, Sept. 8.—Pig iron sales in the past week totaled about 1300 tons, all in small quantities, which is about the way business has been running for many weeks. One encouraging feature, however, was that several melters who had been taking little or no iron recently asked for almost immediate shipment of fairly large lots against their contracts. This occurrence tended to confirm the belief that pig iron stocks in the hands of consumers are almost nil. An Indiana consumer is in the market for 700 to 1000 tons of Southern foundry iron.

Prices per gross ton, deliv'd Cincinnati:

Ala. fdy., sil. 1.75 to 2.25	$14.69
Ala. fdy., sil. 2.25 to 2.75	15.19
Tenn. fdy., sil. 1.75 to 2.25	14.69
S'th'n Ohio silvery, 8 per cent	23.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

COKE

Shipments of foundry coke this month are a little better, suggesting that there may be a slight improvement in foundry operations.

FINISHED STEEL

Sheet mills of this district are operating at about one-third of capacity, which is closely in line with current demand. Bookings of sheets dipped slightly last week. Automobile manufacturers are taking very little, and other sheet users are buying with a conservatism which has marked all steel purchases for some time. Demand for sheets for use in road construction work is declining.

OLD MATERIAL

In a dull market the prices the dealers are offering for various grades of scrap have been reduced sharply in some instances. Dealer purchases are mostly for storage, as there is very little demand from consumers.

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
New billet reinforc. bars	3.00c.
Rail steel reinforc. bars	3.00c.
Hoops	3.90c.
Bands	3.20c.
Cold-fin. rounds and hex	3.50c.
Squares	4.00c.
Hot-rolled annealed sheets (No. 24)	3.75c.
Galv. sheets (No. 24)	4.25c.
Hot-rolled sheets (No. 10)	3.30c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (25 kegs or more)	2.95
Cement c't'd nails, base 100-lb. keg	2.95
Chain, per 100 lb.	10.25
	Net per 100 Ft.
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00
Lap-welded steel boiler tubes, 2-in.	16.50
4-in.	34.50

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$7.00 to	$7.50
Scrap rails for melting	9.00 to	9.50
Loose sheet clippings	3.50 to	4.00
Bundled sheets	6.00 to	6.50
Cast iron borings	3.75 to	4.25
Machine shop turnings	4.00 to	4.50
No. 1 busheling	5.50 to	6.00
No. 2 busheling	3.50 to	4.00
Rails for rolling	9.50 to	10.00
No. 1 locomotive tires	9.00 to	9.50
No. 2 railroad wrought	7.00 to	7.50
Short rails	12.50 to	13.00
Cast iron carwheels	9.00 to	9.50
No. 1 machinery cast	10.50 to	11.00
No. 1 railroad cast	9.50 to	10.00
Burnt cast	4.25 to	4.75
Stove plate	4.25 to	4.75
Brake shoes	4.25 to	4.75
Agricultural malleable	8.00 to	8.50
Railroad malleable	9.00 to	9.50

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BIRMINGHAM

Mid-Summer Dullness Still Marks Iron and Steel Demand

BIRMINGHAM, Sept. 8.—The pig iron market lingers in the midsummer rut, and there are no indications of early improvement. Shipments so far this month have approximated those of August. Melters continue to buy only as needs arise and their requirements as a rule are small. Shipping instructions are also limited. Current consumption is still not up to production, and furnace stocks continue to increase. Quotations for district tonnage are unchanged from a $12 base. Furnace operations for the past two weeks have been the same, with eight furnaces in blast, seven of which are on foundry and one on basic.

Prices per gross ton, f.o.b. Birmingham dist furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$12.00
No. 1 fdy., 2.25 to 2.75 sil.	12.50
Basic	12.00

FINISHED STEEL

For some time past the weekly totals of steel business have been fairly even, and last week was no exception. Sheets are beginning to move somewhat better and there are indications that wire products will soon begin to experience the usual seasonal change. Bookings of fabricators last week were all in small miscellaneous tonnages. Active open-hearths in Alabama last week numbered nine, an increase of one over the preceding week, this having been made by the Tennessee company. The same schedule is being maintained this week.

CAST IRON PIPE

Pressure pipe manufacturers report little change in their situation. Orders of Birmingham plants last week were all for small tonnages and just sufficient to maintain present operating schedules at 40 to 50 per cent. Quotations remain on a nominal base of $35 to $36.

OLD MATERIAL

The past week was very dull. Shipments on mill contracts are low. Buying is negligible. No changes have been made in prices.

Prices per gross ton deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$8.50 to	$9.00
Scrap steel rails		8.50
Short shoveling turnings		6.50
Cast iron borings	(No market)	
Stove plate		7.00
Steel axles	15.00 to	16.00
Iron axles		18.00
No. 1 railroad wrought		8.00
Rails for rolling	11.50 to	12.00
No. 1 cast		9.00
Tramcar wheels	10.00 to	10.25
Cast iron borings, chem.		13.50

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Canada

Pig Iron and Scrap Markets Are Dull

TORONTO, Sept. 7.—Pig iron sales for the week were mostly in single car lots, although it is understood that some larger orders are pending. Melters are not carrying much stock, but are satisfied to take delivery of iron as needs dictate. Prices are unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	21.00
Basic	20.50

STRUCTURAL STEEL

As a result of increased bookings of structural steel contracts, the Montreal plant of the Dominion Bridge Co. has shown a decided pick-up in operations within the past week. This has necessitated considerable increase in the working staff, which is assured of steady employment for several months. At present the company is working on a 2800-ton order for the new docks at St. John, N. B. It is further stated that the shops are being reconditioned to produce steel for several large jobs recently closed for bridge construction for the Provincial Government. The company's engineers are working on estimates for the bridge to be built from the mainland to the Island of Orleans near Quebec. This and the Caughnawaga bridge, plans for which are now awaiting approval by the Federal Government, are the two biggest jobs at present in prospect. It is also stated, however, that estimates are being prepared for a large amount of structural steel work on the Beauharnois power development project.

OLD MATERIAL

Sales have dropped sharply, and local dealers state that current demand is again in a state of stagnation. Im-

provement in demand is looked for within a week or two, however, owing to the fact that consumers have very little stock. Most of the business of the week was in No. 1 machinery cast. Price lists are unchanged.

Dealers' buying prices for old material:

	Per Gross Ton	
	Toronto	Montreal
Heavy melting steel	$7.00	$6.00
Rails, scrap	7.00	6.00
No. 1 wrought	6.00	8.00
Machine shop turnings	2.00	2.00
Boiler plate	5.00	4.50
Heavy axle turnings	2.50	2.50
Cast borings	2.00	2.00
Steel borings	2.00	2.00
Wrought pipe	2.00	2.00
Steel axles	7.00	9.00
Axles, wrought iron	7.00	11.00
No. 1 machinery cast	....	10.00
Stove plate	....	8.00
Standard carwheels	....	8.50
Malleable	....	8.00
	Per Net Ton	
No. 1 machinery cast	11.00	....
Stove plate	9.00	....
Standard carwheels	10.00	....
Malleable scrap	9.00	....

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ST. LOUIS

First Week of September Brings No Improvement

ST. LOUIS, Sept. 8.—During the last week the St. Louis Gas & Coke Corpn. sold 1000 tons of foundry iron in small lots for prompt shipment. As a whole, however, the slight spurt in buying which was shown several weeks ago has subsided, but there is belief that a seasonal pick-up will be in evidence shortly. The stove business is gaining, but the implement trade is said to be at low ebb. Prices are firm. The local maker's shipments for August were about equal to those of July, with September running slightly ahead.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$17.50
Malleable, f.o.b. Granite City	17.50
N'th'n No. 2 fdy., deliv'd St. Louis	19.66
Southern No. 2 fdy., deliv'd	15.42
Northern malleable, deliv'd	19.66
Northern basic, deliv'd	19.66

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

FINISHED STEEL

This has been a week of light business in plates, shapes, bars and sheets. While fabricators report business to be extremely dull and very little in prospect here, a number of projects have been let or are pending in the South and Southwest. Warehouse business in August was slightly under that of July, and September thus far shows no improvement. Factors here are hopeful that the restoration of crude oil to a $1 basis will revive buying from the oil fields.

OLD MATERIAL

The market for old material is virtually at a standstill. One East Side melter has stopped shipments against contracts for 10 days, another is accepting only one car every other day, while one East Side and one West Side mill are accepting no shipments. No. 1 heavy melting steel, No. 2 railroad wrought and steel angle bars are 25c. a ton off and wrought iron bars and transoms are 50c. lower.

Railroad lists: Chesapeake & Ohio, 8123 tons; Baltimore & Ohio, 5640 tons.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

Selected heavy melting steel	$7.75 to	$8.25
No. 1 heavy melting or shoveling steel	7.50 to	8.00
No. 2 heavy melting or shoveling steel	7.00 to	7.50
No. 1 locomotive tires	9.00 to	9.50
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	8.50 to	9.00
Railroad springs	9.00 to	9.25
Bundled sheets	5.00 to	5.50
No. 2 railroad wrought	7.50 to	8.00
No. 1 busheling	6.25 to	6.75
Cast iron borings and shoveling turnings	5.25 to	5.75
Iron rails	7.00 to	8.00
Rails for rolling	10.50 to	11.00
Machine shop turnings	3.00 to	3.50
Heavy turnings	6.00 to	6.50
Steel car axles	11.50 to	12.00
Iron car axles	15.00 to	15.50
Wrot. iron bars and trans.	6.00 to	6.50
No. 1 railroad wrought	5.00 to	5.50
Steel rails, less than 3 ft.	11.00 to	11.50
Steel angle bars	7.50 to	8.00
Cast iron carwheels	6.75 to	7.25
No. 1 machinery cast	8.00 to	8.50
Railroad malleable	6.50 to	7.00
No. 1 railroad cast	7.50 to	8.00
Stove plate	7.00 to	7.50
Relay. rails, 60 lb. and under	16.00 to	16.50
Relay. rails, 70 lb. and over	20.00 to	21.00
Agricult. malleable	6.50 to	7.00

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
Cold-fin. rounds, shafting, screw stock	3.35c.
Hot-rolled annealed sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.35c.
Hot-rolled sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	3.85c.
Galv. corrug. sheets	4.40c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb	60
Machine bolts	70
Carriage bolts	70
Lag screws	70
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	70
Less than 200 lb	60
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	70
Less than 200 lb	60

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BOSTON

Flurry In Scrap Buying Has Subsided—Little Pig Iron Sold

BOSTON, Sept. 8.—Little pig iron was sold the past week, the total falling under 1000 tons. There are no open inquiries, but it is intimated that several of the small foundries will be in the market during the first half of this month and a more substantial number later. Furnace representatives are less inclined to shade prices, consequently the market has the appearance of being firm.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25	$19.91
*Buffalo, sil. 2.25 to 2.75	19.91
†Buffalo, sil. 1.75 to 2.25	19.28
†Buffalo, sil. 2.25 to 2.75	19.28
*Ala., sil. 1.75 to 2.25	$20.11 to 20.61
*Ala., sil. 2.25 to 2.75	20.61 to 21.11
†Ala., sil. 1.75 to 2.25	16.75
†Ala., sil. 2.25 to 2.75	17.25

Freight rates: $4.91 all rail and $4.28 rail and water from Buffalo; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

REINFORCING STEEL

Current bookings are light, mostly in small tonnages, and prices are unsettled. While the trade openly quotes billet bars from stock at 3c. a lb., base, for 1 to 5-ton lots, 2.40c. for 6 to 99-ton lots, and 2.30c. for 100-ton lots and larger, one 90-ton lot was sold the past week at well under 2c. For small lots 3c. is rarely obtained. Rail steel bars at 2.26½c. a lb., delivered Boston rate points, also have been shaded. Indications point to a very good bar business this fall. Most New England States, particularly Massachusetts, have rather elaborate plans for roads and overpass work.

CAST IRON PIPE

With available business confined to scattered carlots, and with foundries hungry for orders, prices are uncertain. Even in carlots, 6 in. and larger pipe is obtainable at $30 a ton, foundry, and in the past week was sold for less. Cambridge, Mass., may be in the market late in 1931 for 16-in. pipe, and another Massachusetts

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.36½c.
Structural shapes—	
Angles and beams	3.36½c.
Tees	3.36½c.
Zees	3.36½c.
Soft steel bars, small shapes	3.26½c.
Reinforcing bars	3.11½c. to 3.26½c.
Iron bars—	
Refined	3.26½c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tire steel	4.50c. to 5.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex.	3.50c. to 5.50c.
Squares and flats	4.00c. to 6.00c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.80c.
	Per Cent Off List
Machine bolts	65 and 5
Carriage bolts	65 and 5
Lag screws	65 and 5
Hot-pressed nuts	40 and 10
Cold-punched nuts	40 and 10
Stove bolts	70 and 10

municipality is considering a sizable purchase.

OLD MATERIAL

The flurry of buying of No. 1 heavy melting steel and other material for Pittsburgh district delivery has subsided, but it left the local trade more hopeful that more buying will soon follow. The only material moving out of New England for Pittsburgh district the past week was hydraulic bundles at $10.50 a ton, delivered. Foundries in certain localities are reported as more active buyers of textile and No. 1 machinery cast from local or nearby yards, but the market is by no means active.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$4.50 to $5.00
Scrap T rails	4.00 to 4.50
Scrap girder rails	3.00 to 3.50
No. 1 railroad wrought	7.00 to 7.50
Machine shop turnings	1.25 to 1.80
Cast iron borings (steel works and rolling mill)	1.50 to 1.75
Bundled skeleton, long	3.00 to 3.25
Forged flashings	5.00 to 5.25
Blast furnace borings and turnings	1.50 to 1.75
Forge scrap	0.50 to 0.80
Shafting	10.00 to 10.50
Steel car axles	11.00 to 12.00
Wrought pipe, 1 in. in diameter (over 2 ft. long)	5.00 to 5.25
Rails for rolling	7.50 to 8.00
Cast iron borings, chemical	7.00 to 7.25
No. 2 cast	5.00 to 5.25
Prices per gross ton deliv'd consumers' yards:	
Textile cast	$9.50 to $10.00
No. 1 machinery cast	9.50 to 10.00
Stove plate	5.00 to 5.25
Railroad malleable	13.00 to 13.50

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Detroit Scrap Market Dull, Prices Unchanged

DETROIT, Sept. 8.—Dullness persisted in scrap during the past week, with the Labor Day holidays accentuating the quietness. Consumers continue out of the market, so that activities are confined to dealers' purchasers. Dealers' stocks, accumulated during the summer in anticipation of a pick-up in steel operations in the fall, are large. Prices are unchanged.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$6.50 to $7.00
Borings and short turnings	4.50 to 5.00
Long turnings	4.00 to 4.50
No. 1 machinery cast	8.00 to 8.50
Automotive cast	11.00 to 11.50
Hydraul. comp. sheets	6.50 to 7.00
Stove plate	5.25 to 5.75
New No. 1 busheling	5.25 to 5.75
Old No. 2 busheling	2.50 to 3.00
Sheet clippings	4.00 to 4.50
Flashings	5.50 to 6.00

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International-Stacey Corpn., Columbus, Ohio, has established an office at 2192 Railway Exchange Building, St. Louis, in charge of B. T. Ehrnman, formerly of the company's Chicago office.

PACIFIC COAST

SAN FRANCISCO, Sept. 7.—Pending projects which are likely to be placed this month will require about 43,000 tons of structural shapes, 7600 tons of reinforcing bars and 3000 tons of cast iron pipe. These estimates cover only the larger projects, among which are the following: 8000 tons of structural shapes for a hangar at the naval air base Sunnyvale, bids for which will be opened in Washington Sept. 23; 5000 tons for transmission towers for the city of Seattle; 4000 tons for a mill for the Consolidated Copper Co. at Kimberly, Nev.; 2000 tons for a bridge across the Oakland Estuary in Alameda County, Cal.; 2500 to 3000 tons for the Lloyd Hotel at Portland, Ore., and 2000 tons for a breakwater at Santa Monica, subject to approval at a bond election Sept. 9.

Awards of structural steel the past week included 2700 tons for the new Federal Building at Seattle, awarded to the Isaacson Iron Works, Seattle, by Murch Brothers Construction Co., St. Louis, general contractor.

Building permits at San Francisco last month were larger than for the same month in 1930.

BARS

Awards for the week were nearly 600 tons, with new inquiries for upward of 1300 tons. Prices on domestic material remain fairly steady.

CAST IRON PIPE

R. D. Wood & Co. were low on the largest specification for several months, embracing 6400 tons of 8 and 12-in. pipes for Los Angeles. Pacific States Cast Iron Pipe Co. took 135 tons of 4 and 6-in for Battle Mountain, Nev. Bids on 400 tons of 6 to 12-in. Class 150 will be opened by Fresno on Sept. 18.

Large Volume of Building Steel May Be Placed This Month

F.O.B. Warehouse Prices

(Less than 5000 Lb.)

	Base per Lb.		
	San Francisco	Los Angeles	Seattle
Plates and struc. shapes, ¼-in. and heavier	2.80c.	3.00c.	2.40c.
Soft steel bars	2.80c.	3.00c.	2.40c.
Reinforcing bars	2.80c.	2.80c.	3.00c.
Hot-rolled annealed sheets (No. 24)	3.90c.	4.00c.	3.50c.
Hot-rolled sheets (No. 10)	3.40c.	3.50c.	3.00c.
Galv. sheets (No. 24)	4.40c.	4.20c.	3.85c.
Struc. rivets, ½ in. and larger, less than 1000 lb.	5.00c.	5.00c.	5.50c.
Special nails: common 4 to 60d; smooth box 4 to 20d; finish 6 and 8d; base per keg	$2.55	$2.45	$2.40
Other wire nails, base per keg	2.80	2.70	2.65
Cement c't'd nails, 100-lb. keg	2.65	2.70	2.65

RAILWAY SUPPLIES

Included in the specifications for reconstruction work on the south jetty at the mouth of the Columbia River, on which the Columbia Construction Co. is low bidder, is the furnishing of 855 tons of 75 lb. relaying rails.

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BUFFALO

Steel Operations Up Slightly This Week—Better Schedules Expected

BUFFALO, Sept. 8. — A fair amount of pig iron buying is proceeding without definite inquiries being sent out. Several lots from 150 tons to 500 tons each have been placed in this manner. It is understood that one order for 1000 tons of foundry iron has also been placed. It is probable that the General Electric Co., which a week or so ago was in the market for about 500 tons of foundry iron, may have covered by this time. Shipments are running even with sales and in some instances are slightly better. Prices are unchanged. Some producers are endeavoring to get $15.50, base, for Eastern shipment, but are accepting $15. One maker, which has maintained a $16 base, is steadily booking small lots.

Prices per gross ton f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$17.00
No. 2X fdy., sil. 2.25 to 2.75	17.50
No. 1 fdy., sil. 2.75 to 3.25	18.50
Malleable, sil. up to 2.25	17.50
Basic	17.00
Lake Superior charcoal	25.28

FINISHED STEEL

The Lackawanna plant of the Bethlehem Steel Co. is operating nine open-hearths, the same as a week ago. Operations during September are expected to be better than during August. The Seneca Iron & Steel Co. is operating its sheet mills at 35 to 40 per cent of capacity. The Republic Steel Corpn. has three open-hearths in operation this week, according to its alternate week program. Other mill operations in the district are unchanged.

OLD MATERIAL

Influence of the Labor Day period

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.25c.
Soft steel bars	3.00c.
Reinforcing bars	2.65c.
Cold-fin. flats and sq.	3.65c.
Rounds and hex.	3.15c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.10c.
Bands	3.35c.
Hoops	3.90c.
Hot-rolled sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$2.45
Black wire, base per 100 lb.	3.20

has brought trading almost to a standstill. Prices are unchanged.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$9.00
No. 2 heavy melting scrap	$7.50 to 8.00
Scrap rails	9.50 to 10.00
Hydraul. comp. sheets	7.50
No. 2 hydraul. comp. sheets	7.00
Hand bundled sheets	7.00
Drop forge flashings	7.50
No. 1 busheling	7.50
Hvy. steel axle turnings	8.00 to 8.50
Machine shop turnings	4.50 to 5.00
No. 1 railroad wrought	7.50 to 8.00
Acid Open-Hearth Grades:	
Knuckles and couplers	10.50 to 11.00
Coil and leaf springs	10.50 to 11.00
Rolled steel wheels	10.50 to 11.00
Low phos. billet and bloom ends	13.00 to 14.00
Electric Furnace Grades:	
Short shov. steel turnings	6.00 to 6.50
Blast Furnace Grades:	
Short mixed borings and turnings	6.00 to 6.50
Cast iron borings	6.00 to 6.50
No. 2 busheling	4.50 to 5.00
Rolling Mill Grades:	
Steel car axles	15.00 to 15.50
Iron axles	16.00 to 16.50
Cupola Grades:	
No. 1 machinery cast	10.00 to 10.50
Stove plate	8.25 to 8.50
Locomotive grate bars	7.00 to 7.50
Steel rails, 3 ft. and under	12.00 to 12.50
Cast iron carwheels	10.50 to 11.00
Malleable Grades:	
Industrial	10.00 to 10.50
Railroad	10.00 to 10.50
Agricultural	10.00 to 10.50
Special Grades:	
Chemical borings	9.00 to 9.50

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Reinforcing Steel

Lettings in Lighter Volume—Inquiries Slightly Higher

BOOKINGS of reinforcing steel the past week totaled only 1625 tons, compared with 3700 tons in the previous week. Awards were all in small tonnages. Inquiries, at 4850 tons, compared with 3000 tons in our previous report. The two largest jobs call for 800 tons each, one for foundations for a Post Office building at Washington, on which bids will be opened Sept. 18, and the other for a highway bridge at Bedford, Ohio. Awards follow:

CAMBRIDGE, MASS., 230 tons, underpass, to Joseph T. Ryerson & Son, Inc.

BOSTON, 150 tons, city printing plant, to Truscon Steel Co.

SOUTH BEND, IND., 190 tons, Post Office, to Concrete Engineering Co.

CHICAGO, 320 tons, Humboldt Park substation for Commonwealth Edison Co., to American System of Reinforcing.

ELLENSBURG, WASH., 110 tons, two concrete bridges, to Pacific Coast Steel Co.

WALLA WALLA, WASH., 190 tons, cell block at State penitentiary, to Pacific Coast Steel Co.

SAN FRANCISCO, 230 tons, Catholic school on Silver Avenue, to W. C. Hauck & Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

BOSTON, 600 tons, Christian Science publishing plant addition.

BOSTON, 125 tons, school.

NEW HAVEN, CONN., unstated tonnage, Connecticut Savings Bank.

UNION CITY, N. J., 225 tons, West Street school; bids open Sept. 22.

NEWARK, N. J., 500 tons, two bridges over route 29; joint project of Essex County Park Commission and Lehigh Valley Railroad.

STATE OF NEW JERSEY, 250 tons, extension of turnpike, route 10, from Mount Pleasant to Newark.

WASHINGTON, 1200 tons, foundations for Department of Justice building; bids opened Sept. 8 by Supervising Architect, Treasury Department.

CANAL ZONE, 1900 tons, Madden Dam project; W. E. Callahan Construction Co., St. Louis, and Peterson, Shirley & Gunther, Omaha, Neb., contractors.

WASHINGTON, 2200 tons, Federal warehouse; H. R. Blagg Co., Dayton, Ohio, general contractor.

WASHINGTON, 700 tons, foundations for Interstate Commerce Commission and Department of Labor building; McCloskey & Co., Philadelphia, general contractors.

WASHINGTON, 800 tons, foundation for Post Office Department building; bids to be opened Sept. 18 by Supervising Architect, Treasury Department.

CHICAGO, 200 tons, distributing station for Firestone Tire & Rubber Co.

BEDFORD, OHIO, 800 tons, highway bridge.

LOS ANGELES, 200 tons, Ohern apartment building, Hollywood Boulevard and Stanley Avenue.

SAN BENITO COUNTY, CAL., 254 tons, State highway structures.

ALAMEDA COUNTY, CAL., 103 tons, box culverts on highways.

SAN FRANCISCO, 200 tons, Health Center building.

SUNNYVALE, CAL., 400 tons, structures for naval air base.

LOS ANGELES COUNTY, CAL., 185 tons, flood control on Los Angeles River.

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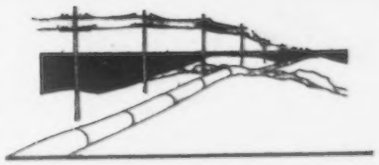
Georgia Manganese Mines May Be Operated

Plans for financing preliminary operations of the Manganese Corpn. of America, White, Ga., which acquired the properties of Georgia Manganese & Iron Co. at foreclosure sale, are reported to be under way. Formation of the new company was effected by the Brunswick Terminal & Railway Securities Co. and American Minerals Corpn., both of New York, holding companies of the Georgia Manganese & Iron Co.

W. A. Hauck, formerly assistant comptroller of Bethlehem Steel Corpn., is president. Harbour Mitchell and Robert W. Maloney, vice-presidents of E. J. Lavino & Co., Philadelphia, and Brunswick Terminal & Railway Securities Co. respectively, hold similar office in the Manganese corporation.

The company has started work in connection with a prospective geological survey of its entire holdings of 14,000 acres of mineral land.



PIPE LINES

Atlantic Pipe Line Co., a subsidiary of Atlantic Refining Co., 260 South Broad Street, Philadelphia, will begin early construction of new pipe line for oil service from east Texas oilfield district to Nederland, Tex.

Phillips Petroleum Co., Bartlesville, Okla., is securing a right-of-way for new pipe line for gasoline service from gasoline plant at Crane City to storage and distributing plant at McCamey, Tex., about 25 miles, estimated to cost about $150,000. Welded 3-in. pipe will be used.

Irvine Pipe Lines, Ltd., James Irvine, head, Santa Barbara, Cal., has secured permission from State Railroad Commission to dispose of common stock in amount of $100,000, proceeds to be used for construction of pipe lines for oil and gas service in vicinity of Santa Barbara, for which plans will soon be arranged. Financing will also include a bond issue of $50,000, proceeds to be used for similar purposes.

Stanolind Pipe Line Co., a subsidiary of Standard Oil Co. of Indiana, 910 South Michigan Avenue, Chicago, has taken bids for construction of series of loop pipe lines along its main line from Healdton, Okla. to Chicago, totaling about 190 miles, to use 12-in., 10-in., and 8 in. pipe. New lines will increase capacity of system by 55,000 bbl. daily, making a capacity of 140,000 bbl. a day.

Department of Wharves, Docks and Ferries, Municipal Pier No. 4, South, Philadelphia, Richard Weglein, director, will receive bids until Sept. 18, for 50 lengths of 18-in. shore pipe.

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Railroad Equipment

Tientsin-Pukow Railway, China, is inquiring for eight 4-8-2 type locomotives.

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Bolt, Nut and Rivet Makers Reorganize

A trade association of bolt, nut and rivet makers has been organized under the name of the American Institute of Bolt, Nut and Rivet Manufacturers. George S. Case, president, Lamson & Sessions Co., Cleveland, is president, and Evans Ward, Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., is vice-president.

Another meeting will be held about Sept. 20 to complete the organization, including the selection of a permanent secretary and to decide on a location for the headquarters. This industry has been without an organization since the dissolution last spring of the Bolt, Nut and Rivet Manufacturers Association.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

MILL PRICES OF SEMI-FINISHED STEEL

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	$29.00
Rerolling, 4-in. and under 10-in., Youngstown	29.00
Rerolling, 4-in. and under 10-in., Cleveland	29.00
Rerolling, 4-in. and under 10-in., Chicago	31.00
Forging quality, Pittsburgh	45.00

Sheet Bars

(Open-Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$29.00
Youngstown	29.00
Cleveland	29.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$29.00
Youngstown	29.00
Cleveland	29.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.60c.
Universal	1.60c.
Sheared	1.60c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$35.00
Cleveland	35.00
Chicago	36.00

PRICES OF RAW MATERIAL

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron, dry, Spanish or Algerian	8c. to 9c.
Iron ore, low phos., Swedish, average 68% iron	10.00c.
Iron ore, basic or foundry, Swedish, average 65% iron	9.00c.
Iron ore, basic and foundry, Russian, average 63% iron	9.00c.
Manganese ore, washed 52% manganese, from the Caucasus	25c. to 27c.
Manganese ore, African or Indian, 50 to 52%	24c. to 26c.
Manganese ore, Brazilian, 46 to 48%	22c. to 24c.
Tungsten ore, high grade, per unit, in 60% concentrates	$12.00 to $12.50

	Per Gross Ton
Chrome ore, 45% Cr_2O_3 crude, c.i.f. Atlantic seaboard	$20.00
Chrome ore, 48% Cr_2O_3, c.i.f. Atlantic seaboard	22.50

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.40
Foundry, f.o.b. Connellsville prompt	$3.25 to 4.50
Foundry, by-product, Ch'go ovens	7.50
Foundry, by-product, New England, del'd	10.50
Foundry, by-product, Newark or Jersey City, delivered	8.70 to 9.10
Foundry, by-product, Phila	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry, by-product, del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.40 to $1.50
Mine run coking coal, f.o.b. W. Pa.	1.50 to 1.60
Gas coal, 3¼-in., f.o.b. Pa. mines	1.70 to 1.80
Mine run gas coal, f.o.b. Pa. mines	1.50 to 1.60
Steam slack, f.o.b. W. Pa. mines	.60 to .75
Gas slack, f.o.b. W. Pa. mines	.60 to .75

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	*$80.00 to $85.00
Foreign, 80%, Atlantic or gulf port, duty paid	*80.00 to 85.00

*Minimum price quoted for lots of 2000 tons or more.

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$28.00 to $30.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		Per Gross Ton Furnace
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	31.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio Furnace

	Per Gross Ton		Per Gross Ton
10%	$25.00	13%	$29.00
11%	26.00	14%	31.00
12%	27.00	15%	33.00

Silvery Iron

F.o.b. Jackson County, Ohio Furnace

	Per Gross Ton		Per Gross Ton
6%	$18.00 to $20.00	11%	$21.00 to $23.00
7%	18.50 to 20.50	12%	22.00 to 24.00
8%	19.00 to 21.00	13%	24.00 to 26.00
9%	19.50 to 21.50	14%	26.00 to 28.00
10%	20.00 to 22.00	15%	28.00 to 30.00

Delivered prices at Chicago are about 50c. a ton below this schedule.

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd, carloads	$1.08
Ferrotungsten, less carloads	$1.15 to 1.25
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrochromium, 2% carbon	17.00c. to 17.50c.
Ferrochromium, 1% carbon	19.00c. to 20.00c.
Ferrochromium, 0.10% carbon	24.50c. to 26.00c.
Ferrochromium, 0.06% carbon	26.50c. to 28.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base per gross ton	91.00
Ferromolybdenum, per lb. contained Mo., delivered	1.00
Calcium molybdate, per lb. contained Mo., delivered	85c.
Ferrophosphorus, electric, 24%, f.o.b. Anniston, Ala., per gross ton	$122.50
Silico spiegel, per ton, f.o.b. furnace, car lots	42.50
Ton lots or less, per ton	47.50
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	105.00
1% carbon grade	115.00
Spot prices	$5 a ton higher

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$13.00
No. 2 lump, Illinois and Kentucky mines	17.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	17.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$40.00	$32.00 to $35.00
Maryland	40.00	32.00 to 35.00
New Jersey	44.00 to 59.00	.....
Ohio	40.00	32.00 to 35.00
Kentucky	40.00	32.00 to 35.00
Missouri	37.00	32.00 to 35.00
Illinois	40.00	32.00 to 35.00
Ground fire clay, per ton	6.50	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$40.00
Chicago	49.00
Birmingham	50.00
Silica clay, per ton	8.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

MILL PRICES OF BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	73 and 10
†Carriage bolts	73 and 10
Lag bolts	73 and 10
Plow bolts, Nos. 1, 2, 3 and 7 heads	73 and 10
Hot-pressed nuts, blank or tapped, square	73 and 10
Hot-pressed nuts, blank or tapped, hexagons	73 and 10
C.p.c. and t. square or hex. nuts, blank or tapped	73 and 10
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅜ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagons nuts	73 and 10
Semi-finished hexagons castellated nuts, S.A.E.	73 and 10
Stove bolts in packages, P'gh.	80, 10, 10, 10 and 5
Stove bolts in packages, Ch'go.	80, 10, 10, 10 and 5
Stove bolts in pkgs., Cleveland.	80, 10, 10, 10 and 5
Stove bolts in bulk, P'gh.	80, 10, 10, 10, 5 and 2½
Stove bolts in bulk, Ch'go.	80, 10, 10, 10, 5 and 2½
Stove bolts in bulk, Cleveland,	80, 10, 10, 10, 5 and 2½
Tire bolts	60, 10 and 10

Discounts of 73 and 10 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.50
F.o.b. Chicago	2.60

Small Rivets

(7/8-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10, 10 and 5
Milled standard set screws, case hardened,	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S.S. thread,	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
Del'd Philadelphia	1.89c.
Del'd New York	1.93c.
F.o.b. Cleveland	1.65c.
F.o.b. Lackawanna	1.70c.
F.o.b. Birmingham	1.70c.
C.i.f. Pacific ports	2.00c.

Billet Steel Reinforcing

F.o.b. P'gh mills, 40, 50, 60-ft	1.60c.
F.o.b. Birmingham, mill lengths	1.75c.
F.o.b. Cleveland	1.55c. to 1.60c.

Rail Steel

F.o.b. mills, east of Chicago dist	1.30c. to 1.35c.
F.o.b. Chicago Heights mill	1.60c.
Del'd Philadelphia	1.49c. to 1.59c.

Iron

Common iron, f.o.b. Chicago	1.70c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.09c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.70c.
Del'd Cleveland	1.78½c.
Del'd Philadelphia	1.80½c.
F.o.b. Coatesville	1.70c.
F.o.b. Sparrows Point	1.70c.
F.o.b. Lackawanna	1.70c.
Del'd New York	1.88c.
C.i.f. Pacific ports	1.85c. to 1.90c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.70c.
F.o.b. Lackawanna	1.70c.
F.o.b. Bethlehem	1.70c.
Del'd Cleveland	1.78½c.
Del'd Philadelphia	1.71c. to 1.76c.
Del'd New York	1.85½c.
C.i.f. Pacific ports	2.05c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, Pittsburgh	1.65c.
Wider than 6 in., P'gh	1.55c.
6 in. and narrower, Chicago	1.75c.
Wider than 6 in., Chicago	1.65c.
Cooperage stock, P'gh	1.75c. to 1.85c.
Cooperage stock, Chicago	1.85c. to 1.95c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.10c.
Bars, Cleveland	2.10c.
Bars, Buffalo	2.10c.
Shafting, ground, f.o.b. mill	*2.45c. to 3.40c.
Strips, P'gh	2.15c.
Strips, Cleveland	2.15c.
Strips, deliv'd Chicago	2.43c.
Strips, Worcester	2.30c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	3.20c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland)

To Manufacturing Trade

Bright wire	2.20c.
Spring wire	3.20c.

To Jobbing Trade

	Base Per Keg
Standard wire nails	$1.90
Smooth coated nails	1.90
Galvanized nails	3.90

	Base per Lb.
Smooth annealed wire	2.35c.
Smooth galvanized wire	2.80c.
Polished staples	2.35c.
Galvanized staples	2.60c.
Barbed wire, galvanized	2.55c.
Woven wire fence, Nos. 9 and 11 gage, per net ton	$55.00
Woven wire fence, No. 12½ gage and lighter, per net ton	60.00

To Retail Trade

	Base Per Keg
Standard wire nails	$2.00
Cement coated nails	2.00
Galvanized nails	4.00

	Base per Lb.
Smooth annealed wire	2.45c.
Smooth galvanized wire	2.90c.

	Base per Lb.
Polished staples	2.45c.
Galvanized staples	2.70c.
Barbed wire, galvanized	2.65c.
Woven wire fence, Nos. 9 and 11 gage, per net ton	$60.00
Woven wire fence, 12½ gage and lighter, per net ton	65.00

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Sheets

Hot-Rolled

	Base per Lb.
No. 10, f.o.b. Pittsburgh	1.70c.
No. 10, f.o.b. Chicago mills	1.80c.
No. 10, del'd Philadelphia	1.99c.
No. 10, f.o.b. Birmingham	1.85c.
No. 10, c.i.f. Pacific Coast ports	2.33c.

(Note: To above prices are added extras for annealing and for width over 48 in., and for less than five tons of each gage or size.)

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.40c.
No. 24, f.o.b. Chicago mills	2.50c.
No. 24, del'd Philadelphia	2.69c.
No. 24, f.o.b. Birmingham	2.55c.
No. 24, c.i.f. Pacific Coast ports	2.88c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.35c.
No. 10 gage, f.o.b. Chicago mills	2.45c.
No. 10 gage, del'd Philadelphia	2.64c.
No. 10 gage, f.o.b. Birmingham	2.50c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.95c.
No. 20 gage, f.o.b. Chicago mills	3.05c.
No. 20 gage, del'd Philadelphia	3.24c.
No. 20, f.o.b. Birmingham	3.10c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	3.10c.

Steel Furniture Sheets

No. 10, f.o.b. Pittsburgh	2.75c.
No. 20, f.o.b. Pittsburgh	3.35c.

(Prices on furniture stock include stretcher leveling but not resquaring).

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.90c.
No. 24, f.o.b. Chicago Mills	3.00c.
No. 24, del'd Philadelphia	3.19c.
No. 24, f.o.b. Birmingham	3.05c.
No. 24, c.i.f. Pacific Coast ports	3.38c.

Long Ternes

No. 24, unassorted, 8-lb. coating, f.o.b. P'gh	3.15c.

Vitreous Enameling Stock

No. 10, f.o.b. Pittsburgh	2.90c.
No. 20, f.o.b. Pittsburgh	3.40c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.65c.
No. 28, Chicago mills	2.75c.

Tin Plate

	Base per Box
Standard cokes, f.o.b. P'gh district mills	$5.00
Standard cokes, f.o.b. Gary	5.10

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)
(Per Package, 20 x 28 in.)

8-lb. coating I.C. $10.30	25-lb. coating I.C. $15.20
15-lb. coating I.C. 12.90	30-lb. coating I.C. 16.00
20-lb. coating I.C. 14.00	40-lb. coating I.C. 17.80

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(1½% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bar	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Round and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	34.00
Light (from rail steel), f.o.b. mill	32.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅝ in. and larger	$2.70
Spikes, ½ in. and larger	2.70
Spikes, boat and barge	2.90
Tie plate, steel	1.95
Angle bars	2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	47	21½	¼ and ⅜	+11	+36
¼ to ⅜	53	27½	½	23	5
½	58	44½	¾	28	11
¾	62	50½	1 and 1¼	31	15
1 to 3	64	52½	1½ and 2	35	18

Lap Weld

2	57	45½	2	23	9
2½ to 6	61	49½	2½ to 3½	28	13
7 and 8	58	45½	4 to 6	30	17
9 and 10	56	43½	7 and 8	29	16
11 and 12	55	42½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	43	26½	¼ and ⅜	+13	+48
¼ to ⅜	49	32½	½	23	7
½	55	44½	¾	28	12
¾	60	49½	1 to 2	34	18
1 to 1½	62	51½			
2 to 3	63	52½			

Lap Weld, extra strong, plain ends

2	55	44½	2	29	13
2½ to 4	59	48½	2½ to 4	34	20
4½ to 6	58	47½	4½ to 6	33	19
7 to 8	54	41½	7 and 8	31	17
9 and 10	47	34½	9 to 12	21	8
11 and 12	46	33½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discounts of 5 and 2½%, and on galvanized by 1¼ points with supplementary discounts of 5 and 2½%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2½ in.	13
3¼ in.—3¾ in.	54	2 in.—2¼ in.	13
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3½ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

Non-Ferrous Metal Markets

Copper Inactive—Tin Stagnant—Lead Active—Zinc Firm

NEW YORK, Sept. 8, 1931.

All the metal markets have been inactive the first week of September, due largely to the Labor Day holidays.

THE WEEK'S PRICES, CENTS PER POUND FOR EARLY DELIVERY

	Sept. 8	Sept. 5	Sept. 4	Sept. 3	Sept. 2
Lake copper, New York	7.87½	7.87½	7.87½	7.87½	7.87½
Electrolytic copper, N. Y.*	7.25	7.25	7.25	7.25	7.25
Straits tin, spot, N. Y.	25.62½	....	25.95	26.45	26.62½
Zinc, East St. Louis	3.80	3.80	3.80	3.80	3.80
Zinc, New York	4.15	4.15	4.15	4.15	4.15
Lead, St. Louis	4.22½	4.22½	4.22½	4.22½	4.22½
Lead, New York	4.40	4.40	4.40	4.40	4.40

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel, electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 6.60c. to 6.65c. a lb., New York.

▲ ▲ ▲

COPPER

There is no life to this market, nor are there any price changes. Such light domestic demand as exists is still being satisfied by one or two custom smelters at 7.50c. a lb., delivered in the Connecticut Valley. Other custom smelters are asking 7.75c., but getting little business. The primary producers still sit on the sidelines asking 8c., but of course selling very little except under special circumstances. Some business is being done for delivery next year, but most of the low price metal is for nearby delivery.

Sales abroad are still exceedingly small. With the price of Copper Exporters, Inc., at 8c., c.i.f. usual European ports, and with the spread between this and the domestic price as wide as it is, not much more could be expected. When a closer relationship is established, it is believed that a heavy business will be done, as melters abroad are not covered far ahead. Interest centers in the August statistics, which will be out next week, and which are not expected to be highly favorable to sellers.

Lake copper is still in poor demand, with the price unchanged at 7.75c. to 7.87½c., delivered.

TIN

In view of the unfavorable statistics for August, briefly outlined in this column last week, which show that supplies of tin are still very large and the demand by no means equal thereto, it is not at all surprising that prices in the first week of September have declined fairly sharply. The decline for the week has been over 1c. a lb. As against a price of 26.75c. for spots Strait tin, New York, last week, the quotation today is 25.62½c. There is practically no demand here and the market has been dull with declines registered almost every day. The same is true of the market in London, where prices during the week have fallen as much as £6 a ton if spot standard is taken as the basis of comparison. This was selling a week ago at £120 a ton, but today was only £114 10s. Future standard was quoted today at £117 2s. 6d. and spot Straits £116. The price at Singapore today was £120, as compared with £126 12s. 6d. a ton a week ago. Stocks in British warehouses for the week ended Sept. 5 were 31,415 tons, a decline of 140 from the previous week, due largely to a shipment of 125 tons to New York. Shipments from the East up to and including Sept. 5 were 9091 tons.

LEAD

Reports from sellers are that September is starting out very favorably as to sales. Today a good-sized carload business was done and last week there was a brisk demand for substantial quantities with some increases in specifications already booked. It is stated that, while July was the largest month this year in point of sales, August will bulk larger than the average for the first seven months. Prices are steady and holding firm at 4.22½c., St. Louis, or 4.40c., New York. Indications are strong that stocks of the metal are being rapidly reduced and that consumption is being brought closer in line with production.

ZINC

August statistics out today show a further decline in stocks of refined metal of about 2100 tons from July. Prices continue firm and unchanged at 3.80c., St. Louis, or 4.15c., New York. These statistics are of course favorable to sellers and, while demand from consumers has been very light for some time, the situation is expected to grow better rather than worse this month. Shipments in August were about 5000 tons less than in July.

ANTIMONY

There is very little change thus far this month and prices for Chinese metal continue at 6.60c. to 6.65c., New York, duty paid, for prompt shipment. Demand is confined to spot carloads and small lots.

New York, Chicago or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	15.37½c.
*Copper, hot rolled, base sizes	17.62½c.
Seamless Tubes—	
Brass	20.25c.
Copper	20.12½c.
Brass Rods	13.62½c.
Brazed Brass Tubes	24.25c.

*Extra for cold-rolled, 3c. per lb.

New York Warehouse

Delivered Prices, Base per Lb.

Zinc sheets (No. 9), casks	9.25c. to 9.50c.
Zinc sheets, open	10.25c. to 10.50c.

Metals from New York Warehouse

Delivered Prices, per Lb.

Tin, Straits pig	28.50c. to 29.50c.
Tin, bar	30.50c. to 32.50c.
Copper, Lake	9.75c. to 10.75c.
Copper, electrolytic	9.25c. to 9.75c.
Copper, casting	9.00c. to 9.50c.
Zinc, slab	5.00c. to 5.50c.
Lead, American pig	5.25c. to 6.25c.
Lead, bar	7.00c. to 8.00c.
Antimony, Asiatic	9.50c. to 10.50c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	20.00c. to 22.00c.
Alum. ingots, No. 12 alloy	19.00c. to 21.00c.
Babbitt metal, commercial grade	20.00c. to 30.00c.
Solder, ½ and ½	18.00c. to 19.00c.

Metals from Cleveland Warehouse

Delivered Prices, per Lb.

Tin, Straits pig	31.50c.
Tin, bar	33.50c.
Copper, Lake	8.87½c
Copper, electrolytic	8.87½c.
Copper, casting	8.25c.
Zinc, slab	5.50c. to 5.75c.
Lead, American pig	5.25c.
Lead, bar	7.75c.
Antimony, Asiatic	10.00c.
Babbitt metal, medium grade	15.00c.
Babbitt metal, high grade	35.50c.
Solder, ½ and ½	21.00c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses. (All prices are nominal because of uncertain condition of market.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	6.00c.	6.75c.
Copper, hvy. and wire	5.75c.	6.50c.
Copper, light and bottoms	4.75c.	5.50c.
Brass, heavy	3.25c.	4.00c.
Brass, light	2.50c.	3.50c.
Hvy. machine composition	4.75c.	5.50c.
No. 1 yel. brass turnings	3.50c.	4.25c.
No. 1 red brass or compos. turnings	4.25c.	5.00c.
Lead, heavy	3.25c.	3.75c.
Zinc	1.50c.	2.00c.
Sheet aluminum	9.50c.	11.50c.
Cast aluminum	3.50c.	5.50c.

FABRICATED STRUCTURAL STEEL

Projects of 37,000 Tons Include Two 10,000-Ton Washington Buildings—Awards Are 41,000 Tons

TOTALING about 37,000 tons, new fabricated structural steel projects are the largest of any week since the end of July and compare with only 20,000 tons of new inquiry a week ago. Included are a Post Office and a building for the Department of Justice in Washington, each requiring 10,000 tons, an addition to the Senate Office Building in Washington, 1200 tons, and 2500 tons to 3000 tons for a hotel in Portland, Ore.

Awards of about 41,000 tons compare with 76,000 tons a week ago and 20,000 tons two weeks ago. Included this week are 23,000 tons for a Parcel Post Building in New York, 2700 tons for a Federal building in Seattle, Wash., 2040 tons for a highway bridge in New Jersey and 2000 tons for tank construction at Beaumont, Tex. Awards follow:

North Atlantic States

WILLIAMSPORT, PA., 175 tons, building for Lycoming Mfg. Co., to Bethlehem Construction Co.

FOXBORO, MASS., 200 tons, two State bridges, to New England Structural Co.

STATE OF CONNECTICUT, 125 tons, highway bridge, to American Bridge Co.

NEW YORK, 23,000 tons, Parcel Post building, to McClintic-Marshall Corpn.

NEW YORK, 500 tons, Kings County Hospital power house, to American Bridge Co.

NEW YORK, 200 tons, billets required by New York Central Railroad for West Side elevated highway, to American Bridge Co.

ST. NICHOLAS, PA., 695 tons, conveyors for Philadelphia & Reading Coal & Iron Co., to American Bridge Co.

STATE OF NEW JERSEY, 2040 tons, highway bridge, route 25, to Fort Pitt Bridge Works Co.

BALTIMORE, 800 tons, highway bridges, to American Steel Engineering Co.

WASHINGTON, 800 tons, public service building, to American Bridge Co.

The South

RICHMOND, VA., 500 tons, bank building, to Virginia Bridge & Iron Works.

LITTLE ROCK, ARK., 1295 tons, Post Office, to Virginia Bridge & Iron Co.

BEAUMONT, TEX., 2000 tons, plates, tanks for Empire Gas & Refining Co., to Chicago Bridge Works.

FRANKLIN, TEX., 137 tons, highway bridge, to Petroleum Iron Works.

MADISONVILLE, TEX., 100 tons, highway bridge, to Petroleum Iron Works.

COLUMBUS, TEX., 446 tons, highway bridge, to Houston Structural Steel Co.

LAFRUITA, TEX., 134 tons, highway bridge, to Houston Structural Steel Co.

SKELLYTOWN, TEX., 500 tons, unidentified jobs at Skellytown and Rapid City, S. D., to Pittsburgh-Des Moines Steel Co.

CALDWELL COUNTY, TEX., 260 tons, bridge, to McClintic-Marshall Corpn.

Central States

DETROIT, 220 tons, grade elimination for Grand Trunk Railroad, to McClintic-Marshall Corpn.

DETROIT, 200 tons, plant addition for Murray Corpn., to Whitehead & Kales Co.

WAKEFIELD, MICH., 200 tons, school, to Worden-Allen Co.

CHICAGO, 600 tons, approach to Wabash Avenue bridge, to Duffin Iron Co.

EVANSTON, ILL., 350 tons, Deering Memorial Library for Northwestern University, to Hansell-Elcock Co.

RACINE, WIS., 200 tons, vocational school, to C. Hennecke Co.

TWO RIVERS, WIS., 550 tons, State highway span, to Worden-Allen Co., Milwaukee.

MILWAUKEE, 190 tons, gymnasium addition to South Division High School, to C. Hennecke Co., Milwaukee.

STATE OF MINNESOTA, 425 tons, highway bridge; 220 tons to American Bridge Co.; 120 tons to Minneapolis-Moline Power & Implement Co., and 85 tons to Clinton Bridge Co.

ST. LOUIS, 200 tons, Des Loge Hospital, to Columbia Iron Works.

KANSAS CITY, MO., 325 tons, office building and hangar, to Kansas City Structural Steel Co.

MISSOURI PACIFIC RAILROAD, 200 tons, grade elimination at Kansas City, Mo., to Kansas City Structural Steel Co.

Western States

SEATTLE, 2700 tons, Federal building, to Isaacson Iron Works.

SAN FRANCISCO, 300 tons, warehouse for Vermont Marble Co., to Western Iron Works.

LAS VEGAS, NEV., 100 tons, Post Office, to Consolidated Steel Co.

LOS ANGELES, 175 tons, plant for Stauffer Chemical Co., to Consolidated Steel Co.

COOLIDGE DAM, ARIZ., 138 tons, spillway, to Consolidated Steel Co.

STRUCTURAL PROJECTS PENDING

Inquiries for fabricated steel work include the following:

North Atlantic States

PHILADELPHIA, 1000 tons, Wills Eye Hospital, Spring Garden Street.

PHILADELPHIA, 600 tons, factory at Eleventh and Wharton Streets for Consolidated Cigar Corpn.

JENKINTOWN, PA., 200 tons, apartment building at Florence and West Avenues.

POTTSTOWN, PA., 100 tons, power house and laundry building for Hill School, Chestnut and Grant Streets.

WILKES-BARRE, PA., 250 tons, branch for Swift & Co. on North Pennsylvania Avenue.

PENNSYLVANIA RAILROAD, 175 tons, bridge at Stelton, N. J.

POTTSVILLE, PA., 400 tons, high school; general contractor, I. Reindollar & Son, York, Pa.

WASHINGTON, 10,000 tons, Department of Justice Building; bids open Oct. 1.

EAST CAMBRIDGE, MASS., 100 tons, Third District Court House.

STATE OF MASSACHUSETTS, 800 tons, highway bridges.

STATE OF NEW YORK, 1000 tons, highway bridges.

NEW YORK, 1000 tons, Union Club building, Park Avenue.

JERSEY CITY, N. J., 2000 tons, State armory.

WASHINGTON, 10,000 tons, Post Office Department building; bids to be taken by Supervising Architect, Treasury Department, date not yet set.

WASHINGTON, 1200 tons, addition to Senate Office Building; bids Sept. 16.

Central States

CEDAR RAPIDS, IOWA, 700 tons, Post Office; J. P. Cullen & Sons, Janesville, Wis., general contractors.

ALTON, ILL., 350 tons, building for Principia College.

Western States

BOULDER DAM, ARIZ., 500 tons, rock crusher; through Six Companies, general contractors.

PORTLAND, 2500 to 3000 tons, Lloyd Hotel.

WENATCHEE, WASH., 750 tons, bridge across Columbia River.

LOS ANGELES, 1000 tons, sheds for harbor piers 144, 145 and 146.

VENTURA, CAL., 375 tons, County bridge across Santa Clara River.

SEATTLE, 100 tons, piers for Northern Pacific Railroad.

LOS ANGELES, 200 tons, Virgil High School.

LOS ANGELES, 400 tons, 200 tons each for women's and men's gymnasiums, University of California at Los Angeles.

SANTA MONICA, CAL., 2000 tons, breakwater.

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Lewis Institute, Chicago, in cooperation with American Machinery and Tools Institute, 40 North Wells Street, Chicago, is offering a two-year course for training skilled workers for the machinery and tool industry. The course includes machine shop practice, forging and heat treating, and drawing and designing.

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Sales of mechanical stokers in July totaled 101 units of 20,735 hp., against 111 of 29,889 hp. in June, according to reports received by the Bureau of the Census from the 11 leading manufacturers. Sales in the first seven months of 1931 totaled 571 stokers of 150,737 hp., compared with 720 of 221,672 hp., in the corresponding period of last year.

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Spang, Chalfant & Co., Inc., Pittsburgh, maker of steel pipe, in the six months ended June 30 had consolidated net profit of $1,268, after depreciation, interest and taxes, comparing with $1,881,980 in the corresponding 1930 period.

British Outlook Better But Continental View Is Still Pessimistic

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Winter outlook for German mills poor, and plans for curtailed operations are discussed.

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Japan sells pipe to Java and Straits Settlements, but withdraws from China because of low prices.

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Soviet Union exports copper from modernized mines and smelters at 10 to 15 per cent under American prices.

* * *

Chinese steel works closed by floods, and Canton Government boycotts German products.

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(*By Cable*)

LONDON, ENGLAND, Sept. 7.

THE Government will announce plans this week for meeting the financial emergency, and is expected to have a good working majority to force through an emergency budget and economy bill, despite probable violent opposition from a disrupted Labor Party.

Business sentiment is slightly improved and fall prospects are considered better, now that the country is abandoning a policy of drift.

Continental business is quiet and prices are weak. A coal miners' strike is threatened in Belgium, and the Longwy Steel works has blown out two of its blast furnaces at Moulaine because of depression in the pig iron market.

The Schneider-Creusot works in France is reported to have concluded a contract with the Latvian Government for delivery of locomotives, rails and other railroad materials valued at more than 42,000,000 fr. ($1,646,400). Latvia was granted a four-year loan and a cash credit of 10,000,000 fr. ($392,000).

German steel interests deny that a further amalgamation of Ruhr steel works is likely, although it is admitted that severe conditions may necessitate close working agreements not involving actual mergers. This is believed to refer to contemplated extensions of the system, under which groups exchange orders, a method already adopted by the Hoesch Steel Works and Gutehoffnungshütte on shapes and rails.

With German steel mills reaching a limit of rolling for stock, various plans are being discussed to meet the situation, including suggestions for entirely closing the Ruhr industry. An alternative suggestion calls for groups of mills to suspend operation in rotation.

The Peiner Walzwerk in Germany is dismissing 300 men, and the Daimler-Benz works has halved its already reduced working week. The Baroper Walzwerk is suspending completely, and the Mannesmann Rohrenwerke is closing its last two open-hearth furnaces at Grillofunke.

The Central European group of the Continental Steel Cartel has renewed its territorial protection agreement with Poland until 1936.

French competition in Continental markets is increasingly evident as the domestic trade of French mills declines. Meanwhile, the outlook for German steel producers during the coming winter is pessimistic. A leading German industrialist has suggested the possibility of a "hunger export drive" to secure orders for the mills at any cost.

It is reported from India that following a Government investigation of the railroads, it has been proposed to resume the use of Thomas steel rails.

Japan continues a growing factor in Far Eastern export trade and has sold 10,000 tons of pipe to Java, Dutch East Indies at an average price of $39 a ton and 5000 tons to the Straits Settlements at $41 a ton.

In China, the Hankow steel works has been forced to close by the floods and is likely to remain idle for some weeks. The Canton Government is boycotting German products as a result of a trade dispute.

The Welsh tin plate market is quiet and certain mills have accepted 13s. 1½d. ($3.19) per base box, f.o.b. works port. The outlook is poor, but sellers believe that consumers in all markets are inadequately stocked.

Galvanized sheet buying is still small and it is believed that makers would be willing to shade £8 17s. 6d. a ton

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp with the £ at $4.8665 (par)

British Prices, f.o.b. United Kingdom Ports

Ferromanganese, export	£9	0s.				$43.74			
Billets, open-hearth	£4	17½	to	£5	5s.	23.69	to	$25.52	
Black sheets, Japanese specifications	£9	10	to	£9	15	46.17	to	47.39	
Tin plate, per base box	£0	13⅛	to	£0	13⅛	3.19	to	3.25	
						Cents a Lb.			
Steel bars, open-hearth	£7	17½	to	£8	7½	1.71	to	1.81	
Beams, open-hearth	£7	7½	to	£7	17½	1.60	to	1.71	
Channels, open-hearth	£7	12½	to	£8	2½	1.66	to	1.76	
Angles, open-hearth	£7	7½	to	£7	17½	1.60	to	1.71	
Black sheets, No. 24 gage	£8	2½	to	£8	7½	1.76	to	1.81	
Galvanized sheets, No. 24 gage	£8	15	to	£8	17½	1.90	to	1.92	

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£2	6½s.	to	£2	7s.	$11.30	to	$11.42	
Billets, Thomas	£2	18	to	£2	18½	$14.09	to	$14.22	
Wire rods, low C., No. 5 B.W.G.	£4	15	to	£5	0s.	23.09	to	$24.30	
Rails, light	£6	0				29.26			
Black sheets, No. 31 gage, Japanese	£11	5	to	£12	12	54.68	to	58.32	
						Cents a Lb.			
Steel bars, merchant	£3	4	to	£3	5	0.70	to	0.72	
Beams, Thomas, British standard (nominal)	£3	4½	to	£3	5	0.71	to	0.72	
Channels, Thomas, American sections	£5	12	to	£5	14	1.24	to	1.26	
Angles, Thomas, 4-in. and larger, over ⅜-in. thick	£3	3	to	£3	3½	0.69	to	0.70	
Angles, Thomas, 3-in.	£3	5	to	£3	6	0.71	to	0.72	
Hoops and strip steel over 6-in. base	£4	0	to	£4	2½	0.90	to	0.92	
Wire, plain, No. 8 gage	£5	0	to	£5	1¼	1.09	to	1.10	
Wire, barbed, 4-pt. No. 12 B.W.G.	£8	10				1.87			

(1.92c. per lb.) for No. 24 gage corrugated sheets in bundles.

Luxemburg output in July was 177,000 tons of pig iron and 182,000 tons of raw steel. French production was 680,000 tons of pig iron and 650,000 tons of raw steel.

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Japanese Not Selling to China at Present Prices

HAMBURG, GERMANY, Aug. 26.—Continental steel exporters report that Japanese steel interests have almost entirely withdrawn from the Chinese market, being unwilling to accept further business there at the prevailing level of prices, especially for bars, shapes and plates. Prior to withdrawing from sales in China, the Japanese works are said to have sold at 16 to 17 yen ($7.90 to $8.40) a ton under cost of production.

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Soviet Union Buys Rails and Pipe

HAMBURG, GERMANY, Aug. 26.—Soviet buying in Europe continues to be heavy. An order for 10,000 tons of heavy steel pipe has been placed with the Bismarck Hutte Katowitz, and 23,000 tons of light rails has been placed with German mills. The Soviet Union is also negotiating with German mills for 35,000 to 40,000 tons of various steel products, but the sellers have not yet agreed to the credit terms demanded. An order for $610,000 worth of rails to be delivered over the next three months has been awarded to the Rimamurany Steel Works, Hungary.

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Industrial Accidents Decline in Germany

BERLIN, GERMANY, Aug. 24.—Official statistics on industrial accident rates in Germany show a steady decline. In the coal and iron industry the rate per 1000 operatives has declined from 0.92 in 1928 to 0.73 in 1929 and 0.69 in 1930. A further reduction in the accident rate is expected for this year.

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Many German Plants Forced to Suspend

HAMBURG, GERMANY, Aug. 26.—In the past week six manufacturers of iron and steel products in Germany have suspended payments on their obligations, 11 machinery builders and 31 hardware makers have been forced to shut down their plants, and 40 other manufacturers have closed parts of their plants, dismissing several thousand workmen.

These suspensions are attributed in part to the almost total lack of domestic buying since the beginning of the German economic crisis. The Federation of German Machinery Manufacturers states that unless demand revives soon many more machinery plants will be forced to close. Export business continues, but is curtailed.

As an example of the financial situation in Germany, the Stahlwerk-Erkrath A.G., a modern, well-equipped plant for cold-rolled strip, sheets, hoops and alloy steels, built at an original cost of 2,100,000 m. ($497,700), and modernized throughout six years ago at a cost of 750,000 m. ($177,750), was sold recently to a merchant at 135,000 m. ($31,995).

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Steel Coaches Safe in German Rail Wreck

BERLIN, GERMANY, Aug. 24.—The completely modern, all-steel railroad coaches being used on German railroads are said here to have prevented any loss of life in the recent wreck of a Berlin to Switzerland express, when it was blown up with about 110 lb. of dynamite while traveling 66 miles an hour. The entire train was thrown from the track and the coaches rolled down a 17-ft. embankment. A number of passengers were seriously injured, but none was killed. The coaches are being repaired for further service.

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German Scrap Prices at New Low Levels

BERLIN, GERMANY, Aug. 24.—Prices of steel scrap are at new low levels. Compressed sheet scrap has been sold at 19 m. ($4.50) a metric ton, delivered in the Berlin district; machine shop turnings at 12 m. ($2.84) a ton, delivered, and heavy melting steel at 20 m. ($4.74) a ton, delivered. An old German warship, the Lothringen, has been sold for scrap. Representing 13,200 tons of material, it brought 246,000 m. ($58,302), or about $1.19 a ton.

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Soviet Union Exporting Copper Surplus

HAMBURG, GERMANY, Aug. 24.—The Soviet Union is beginning to offer copper for export at delivered prices 10 to 15 per cent under the current quotation of Copper Exporters, Inc., the American export organization. Since 1928, American engineers have been reorganizing and modernizing the Russian copper mines and smelters so that the Soviet is able now to supply almost all its own requirements and has an export surplus. Austrian and German consumers have recently bought Soviet copper and report that it is of good quality. Russian copper is being exchanged for Austrian machinery, trucks and alloy steels.

German Steel Output Gained in July

WASHINGTON, Sept. 8.—German steel output gained 24,452 tons in July, which was the largest month since March, says a report to the Department of Commerce from Berlin. Pig iron production, however, decreased 6276 tons in July to 569,201 tons, with 59 furnaces in blast at the end of the month. Foreign trade also declined. Imports dropped 6520 tons to a total of 53,497 tons, and exports declined to 263,926 tons, a loss of 53,497 tons from June.

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Machine Tool Map Shows Concentration of Industry

A large group of industries in the United States which purchase machine tools is shown in a map prepared by the Industrial Machinery Division, Department of Commerce. Data compiled by the division show that the value of products of these industries was increased by $5,428,015,145 in 1927 through manufacturing processes. Out of more than 3000 counties in the country, 22 contain machine tool using industries the value of whose products was increased $2,606,522,329, or 48 per cent of the total value added by manufacture. In all, 417 counties have 96.9 per cent of the value added by manufacture in the grouping considered, while 686 other counties take care of the remaining 3.1 per cent. The map is colored by counties and each coloring is based on the value added by manufacture of the metal-working machinery using plants.

The map does not include all industries, as it was felt it would be better to break these into three or four groupings. Maps are being prepared for the other groups to which machine tools can be sold.

Among the classifications covered in the map which has been prepared are aircraft and parts, agricultural implements, electrical machinery, engines, turbines, tractors, cash registers, foundries and machine shops, the automotive industry, hardware machine tools, metal working machinery, mechanical refrigerators, typewriters and a number of other miscellaneous industries in all of the 29 types included.

The division announces that copies of the map and figures showing the number of plants by county and the total valuation of the plants of each type by county are available for loan by applying to the Bureau of Foreign and Domestic Commerce.

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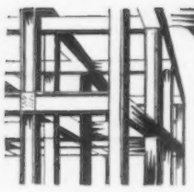
Orders for fireproof safes in July were valued at $208,311, against $247,978 in June, according to reports received by the Bureau of the Census from 15 manufacturers.



PLANT EXPANSION AND EQUIPMENT BUYING

Motor Manufacturer Buys Large Lot of Equipment

Lycoming Mfg. Co., Williamsport, Pa., Places Orders for About $400,000 Worth of Machine Tools

COMING on top of the large orders placed recently by the Chevrolet Motor Co., the purchase of about $400,000 worth of machine tool equipment the past week by the Lycoming Mfg. Co., Williamsport, Pa., which is controlled by the Auburn Automobile Co., has raised hopes of the machine tool industry that automobile model changes this fall will bring forth considerable more equipment buying. Orders of the Lycoming Mfg. Co. were divided among a number of machine tool manufacturers.

The large amount of business placed during August by the Chevrolet company makes it appear that the machine tool index for that month of the National Machine Tool Builders' Association may show an upturn after a continuous decline since March. It now develops that the Chevrolet orders totaled nearer to $1,000,000 than the $500,000 estimated a week ago. One order not previously reported was for about $250,000 worth of hobbing machines, placed with a Cleveland company.

Although the general run of machine tool business shows no change with the coming of September, the trade is slightly more hopeful that resumption of manufacturing by a great many plants that have been shut down and the return of plant executives from long-extended vacations will result in a little more business. A rising demand for repair parts is a fairly good indication.

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NEW YORK

The Eastern machine tool market, which has been extremely dull for months, took on a sudden spurt of activity the past week with the closing of orders for about $400,000 worth of shop equipment for the Lycoming Mfg. Co., Williamsport, Pa., which is controlled by the Auburn Automobile Co. Several machine tool builders shared in the business. The Lycoming plant manufactures motors for the Auburn and Cord automobiles. The outlook for September bookings is somewhat more hopeful, due to the fact that two large orders that have been pending for some time will soon be placed. One is to cover the equipment for subway repair shops in New York, about 50 metal-working and wood-working machines, and the other is for the Brooklyn Navy Yard, about 20 tools, which may be bought this week.

CLEVELAND

Inquiry for single tools gained slightly the past week and, with the ending of the vacation season, feeling in industry is slightly more optimistic. However, orders still are very scarce. The automotive industry is looked on to supply most of the orders that come out the next few months, and the amount of business from that source will depend largely on the new equipment that will be needed for changes of models. Purchases by the Toledo plant of the Chevrolet Motor Co. are reported to be about finished, although a few odd tools may still be needed. An order for hobbing machines, amounting to about $250,000, which went to a Cleveland manufacturer, was one of the recent purchases by this company.

CINCINNATI

While interest in new tool equipment continues to lag, increases in repair orders from some quarters indicate a user consciousness of the need for tool improvement. Some manufacturers interpret this repair demand as a forerunner of the anticipated uptrend. Fresh bookings, however, continue to be small. Production is about one-third of capacity. Several plants are closed this week.

NEW ENGLAND

The dullness of business is accentuated by a dearth of new inquiries. Local dealers took advantage of business conditions to close Saturday, Sept. 5. While the used tool market is quiet, there are spasmodic sales periods, and quite a few new inquiries are in the market. The introduction of new types of gages and cutting equipment has served to maintain a fairly good volume of small tool sales. Some small tool houses report August sales as slightly larger than those for the corresponding month last year, but business with a majority was a shade less.

CHICAGO

Following one of the dullest months in the history of the machinery trade in this district, September is beginning with little change in the character of demand. Sizable industrial lists are almost entirely lacking and only occasional tools are being wanted by the railroads, most of which are deferring purchases until late in the fall. With many of their repair shops closed for indefinite periods, the possibility of new buying is very slight. The same can be said for the farm implement group, and when production is resumed next month in some of the plants which are now idle there will be little equipment to be bought.

The Illinois Iron & Bolt Co., Carpenterville, Ill., is purchasing some production machinery to be required for certain contracts recently received from the Bendix companies. The Bendix organization has let a number of contracts to outside manufacturers because of considerable activity at its own plants. A little machinery business from high schools is in prospect, the largest job of this kind being the Lane Technical School, now under construction. Several hundred thousand dollars' worth of tools will be bought for this project, but formal in-

COST CUTTING with AUTOMATIC VERTICAL TURRET LATHES

A battery of these single spindle automatic chucking machines will effect important savings on your short run production jobs.

There may be just a few pieces in the lot or there may be many—quantity makes no difference; the advantages and economies are there just the same.

Then again there may be several lots of different shapes and sizes all needed at the same time. Gang 'em on a battery of 20" Auto-Matic Vertical Turret Lathes. One man is all that is needed for several machines.

The two pieces at the left were completely machined in three operations with one set-up and one operator on the battery of 20" Auto-Matic Vertical Turret Lathes shown above. Try doing this as economically by any other method.

Complete details regarding 20" Auto-Matic Vertical Turret Lathes are yours promptly for the asking.

BULLARD

AUTO MATIC
VERTICAL
TURRET
LATHE

THE BULLARD COMPANY

Bridgeport, Connecticut

quiry may not appear before 1932. Radio manufacturers in the Chicago district are operating at a fair rate, but scarcely any new equipment is being purchased.

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New York

SUPERSTRUCTURE will begin on new storage and distributing plant, 125 x 300 ft., by Great Atlantic & Pacific Tea Co., 420 Lexington Avenue, New York, on 3-acre tract recently acquired at Hawthorne, N. J., for which general contract has been let to Austin Co., New York. Plant will include cold storage and refrigerating department, mechanical-handling and conveying equipment, etc., and will cost about $250,000.

Department of Hospitals, Municipal Building, New York, has plans for a one-story repair shop, 100 x 200 ft., with automobile service and garage facilities, at Kings County Hospital, Brooklyn, to cost about $100,000 with equipment. Le-Roy P. Ward, 205 East Forty-second Street, New York, is architect.

Sinclair Refining Co., 45 Nassau Street, New York, is considering extensions and improvements in oil refinery at Fort Worth, Sex., lately acquired. Program will include reconstruction of part of unit and equipment replacements, to cost over $1,000,000.

Albert Pomelek, 350 East Ninety-first Street, New York, and associates have organized Al Pom Metal Tile Corpn., with capital of $10,000, to operate a plant in Bronx for manufacture of sheet steel stampings and kindred products. William West, 465 West 157th Street, New York, is interested in company.

Consolidated Gas Co., 4 Irving Place, New York, is planning erection of new exhaust station in connection with expansion at gas plant at Hunts Point, also a new conveyor system, to cost over $50,000. New York & Queens Gas Co., same address, an affiliated organization, plans erection of coke storage and distributing pockets at gas plant at Newtown, L. I., to cost about $60,000 with equipment.

Mercer Engineering Works, Inc., New York, recently organized by Earle R. Lightbourne, 7 Scott Place, Jamaica, L. I., and associates, with capital of $20,000 and 500 shares of common stock, no par value, plans operation of plant for manufacture of machinery and parts and other products. Company is represented by Klein, Kinsley & Klein, 342 Madison Avenue, New York, attorneys.

Board of Education, Park Avenue and Fifty-ninth Street, New York, has taken bids on general contract for a four-story vocational and continuation school at Richmond, S. I., 180 x 220 ft., to cost over $1,000,000 with equipment. W. C. Martin, Flatbush Avenue Extension and Concord Street, Brooklyn, is school architect.

Board of Education, Elizabeth, N. J., will soon have plans for a new manual arts training school. City Council is arranging a fund of $120,000 for purchase of a site. School unit will cost over $150,000 with equipment.

General Electric Co., Schenectady, has plans for an addition to plant at 5 Lawrence Street, Bloomfield, N. J., to cost over $30,000 with equipment.

S. & J. Tool Co., Perth Amboy, N. J., care of David T. Wilentz, 265 Madison Avenue, attorney, recently formed by William H. Dickson, Perth Amboy, and associates, plans operation of local factory for manufacture of tools and other equipment.

Central Railroad of New Jersey, Elizabethport, N. J., has authorized immediate resumption of operations at local railroad repair shops, giving employment to about 1800 men, compared with full quota of 3000, on a five-day-week basis.

David H. Smith & Sons, Inc., with warehouses at foot of Fifty-first Street, Brooklyn, has acquired Waters Arc Welding Corpn., New York. Hereafter welder made by latter company will be manufactured under name of Smith-Waters welder.

American Screw Products Co., Inc., has leased building at 242 North Senth Street, Newark, for manufacture of screw machine products. John A. Cuzzone, formerly of John A. Cuzzone Co., Newark, heads new company.

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South Atlantic

IN connection with new concrete-mixing and distributing plant being established by Arundel-Brooks Concrete Corpn., Baltimore, recently organized, on property on South Wolfe Street, with waterfront facilities, company will remodel four-story warehouse units on site for new machine and repair works, automobile service and garage structure for company motor trucks and other service. Concrete-mixing plant will have an initial capacity of 1000 cu. yd. a day, and it is proposed to increase output later to 3000 cu. yd. All machinery will be of automatic type. Entire project will represent investment of close to $90,000. W. B. Brooks, Jr., an official of Sanford & Brooks Co., Pennington Avenue, contractor, is president of new organization; R. A. Froehlinger is secretary and treasurer.

Chemical Warfare Service, Edgewood Arsenal, Md., is asking bids until Sept. 16, for 17,660 elbow nozzles.

Interstate Body Works, Bristol, Va.-Tenn., manufacturer of automobile bodies, has awarded general contract to A. A. Overbay, Bristol, for new one-story plant, 60 x 120 ft., to cost about $40,000 with equipment.

Superintendent of Lighthouses, Charleston, S. C., is asking bids until Sept. 15 for three 5-kw. Diesel engine-driven electric generating sets.

City Council, Danville, Va., contemplates installation of machine and repair shop in new armory to cost about $150,000, for which bids on general contract are being asked until Sept. 22.

Model Stoker Co., Inc., 316 East Main Street, Richmond, Va., manufacturer of stokers, parts, etc., is considering installation of additional equipment, including

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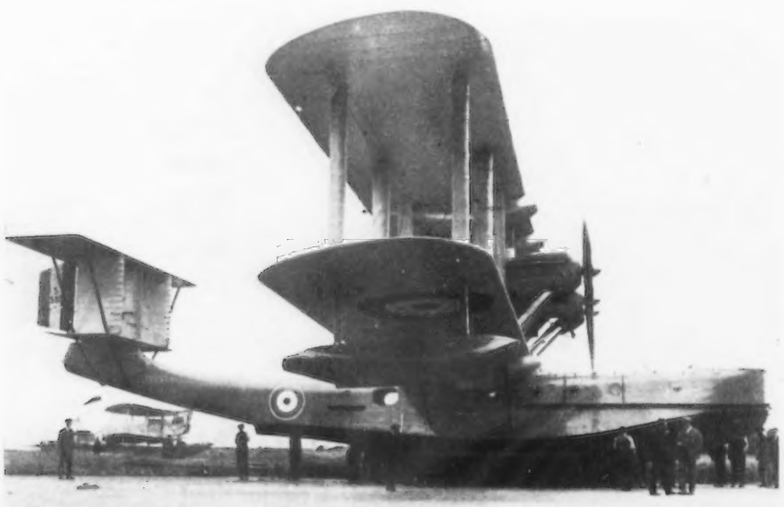

British Build Flying Boat For Coastal Patrol

A LEVIATHAN of the air prepares for its initial flight. The "Iris 111" built for military reconnaissance and coastal patrol by the Blackburn Aeroplane & Motor Co., Ltd., Brough, East Yorkshire, England, is 67 ft. 4 in. overall, has a wing spread of 97 ft. and height of 23 ft. 6 in. The weight is 19,301 lb. without load and 29,000 lb. loaded. The fuselage is of riveted aluminum alloy sheets and the spar and rib sections are of the same alloy covered with treated fabric.

one or two lathes, sheet metal machine, two drill presses and other tools.

General Purchasing Officer, Panama Canal, Washington, is asking bids until Sept. 17 for 42,000 ft. cable, quantity of steel cap screws, 2000 lb. galvanized wire staples, 20,000 spring steel cotters, wrought steel hinges, strap hinges and other iron and steel products; until Sept. 23 for gasoline engine, car wheels, journal boxes, wrought iron or steel pipe, conductor rail, wire-gage drills, hacksaw blades, Stillson wrenches, paint drums and cans, etc.; until Oct. 14 for hydraulic and electrical equipment for Madden power plant, Panama. Last noted project will cost over $10,000,000.

Carolina Marble Quarries, Asheville, N. C., is planning expansion and improvements, including one-story cutting and finishing plant, quarry equipment, etc., to cost over $35,000.

Town Council, Conway, S. C., E. H. Snider, town clerk, is contemplating purchase of a crude oil engine, about 45 hp., direct-connected to a 25-kw. generating unit.

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Philadelphia

NEGOTIATIONS are under way by Philadelphia Electric Co., Tenth and Chestnut Streets, Philadelphia, for purchase of controlling interest in Philadelphia Steam Co., organized some time ago with capital of $1,000,000 to operate a central steam heating service. Last noted company has work under way on plant facilities and distributing system. Purchasing company will carry out expansion for increased steam plant and distributing lines.

Lemuel B. Schofield, director, Department of Public Safety, City Hall, Philadelphia, is asking bids until Sept. 17 for quantity of fluted posts, one-way and two-way adjustable post type signal lanterns, automatic and manual street traffic signal controls, signal posts, etc.

Department of Supplies and Purchases, City Hall Annex, Philadelphia, Jay Lit, director, will receive bids until Sept. 15 for road rollers, loaders and other equipment.

United States Postal Meter Corporation of Pennsylvania, Inc., Philadelphia, recently organized by John Blakeley, 509 Spring Avenue, Elkins Park, Pa., and associates with capital of $40,000, plans operation of plant at Philadelphia for manufacture of postal meter machines, including parts and repair facilities. C. Plantou Middleton, 637 West Phil-Ellena Street, and E. Stanley Richardson, 326 Allens Lane, Philadelphia, are interested in company.

Department of Institutions and Agencies, State Office Building, Trenton, N. J., has awarded general contract to Perth Amboy Construction Co., Perth Amboy, N. J., for a one-story hangar, 110 x 160 ft., with shop and reconditioning facilities at Newark Airport, Newark, to cost over $75,000 with equipment. Charles N. Leathem, Jr., Division of Architecture and Construction, State Office Building, is architect. Department is arranging call for bids for two new industrial buildings at State Prison Farm at Bordentown, each two stories, 35 x 268 ft. and 35 x 185 ft., to cost over $200,000 with equipment.

Board of Education, Pottsville, Pa., plans installation of manual training equipment in new three and four-story and basement high school, 246 x 401 ft., for which bids have been asked on general contract, to cost over $850,000 with equipment. William B. Ittner, Inc., Continental Life Building, St. Louis, is architect.

Martin and H. C. Moul, Hanover, Pa., have organized Hanover Machine Corpn., with capital of $30,000, and plan operation of local factory for manufacture of machinery and parts. A. Guy Moul and C. M. Hesson, Hanover, will be officials of company.

Philadelphia Storage Battery Co., Ontario and C Streets, Philadelphia, is giving over part of output to commercial radio and television sets, under license secured from Television Laboratories, Inc., controlling Farnsworth television patents, and is arranging to market new sets in fall, when increased production facilities will be carried out.

Aluminum Novelty Mfg. Co., Inc., 88-94 East Northampton Street, Wilkes-Barre, Pa., is now in production, manufacturing three types of seamless aluminum lunch kits.

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New England

PLANS have been filed by L. G. Balfour Co., County Street, Attleboro, Mass., manufacturer of jewelry specialties, plated metal goods, etc., for a three-story addition, including power house, to cost over $125,000 with equipment.

Arthur A. Crafts Co., 125 Summer Street, Boston, manufacturer of industrial diamond tools, etc., has leased floor in building at 155 Brookline Avenue, Cambridge, Mass., for expansion.

Neilan Co., Ltd., Boston, recently organized by Marion I. Brown, 1 Federal Street, and associates, with capital of $100,000, contemplates operation of local factory for manufacture of devices and instruments for temperature control. Robert R. Thurber, address noted, will be president.

New England Fuel & Transportation Co., Everett, Mass., has taken out permits for two-story coke-screening build-

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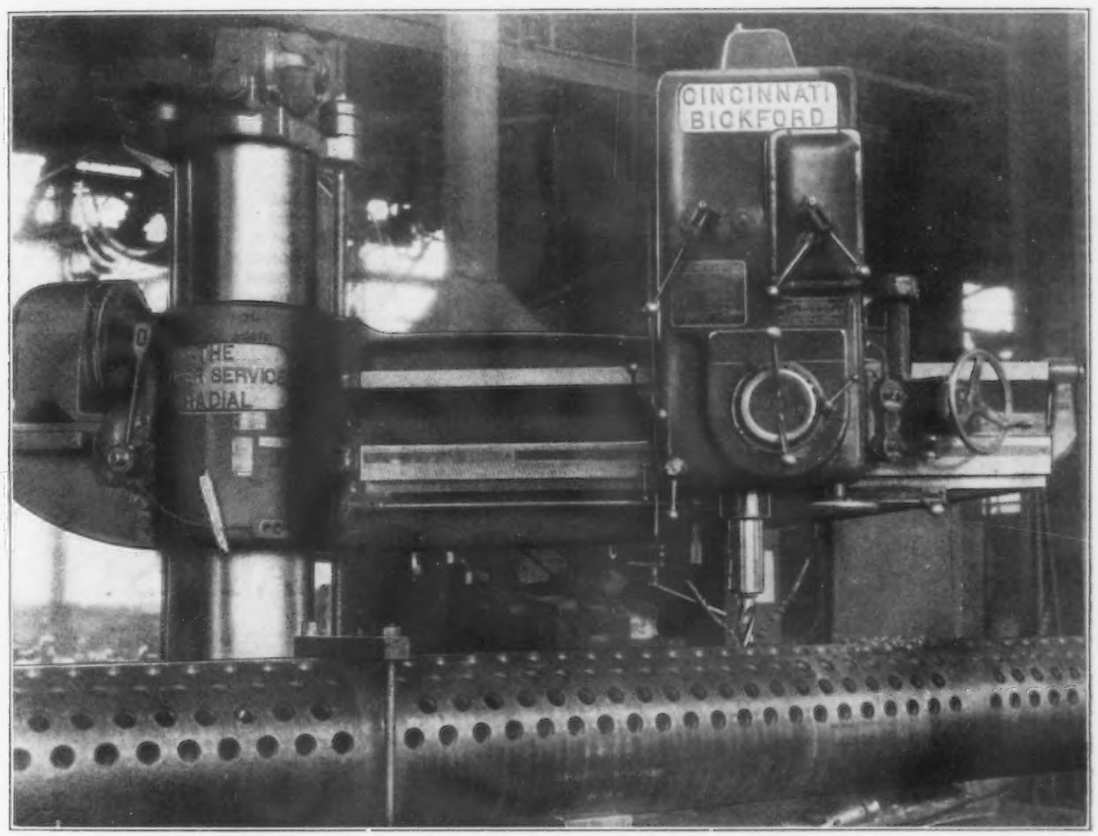
RUSTLESS STEEL USED IN NEW SHIP

HIGH-chrome-nickel alloy steel is widely used in the new Dollar Line ship President Hoover and will be similarly applied in the sister ship President Coolidge, now under construction. More than eight tons of Allegheny metal in sheets and strip has been used for installations in the galley, including dresser and table tops and for the pantries.

Cabinets in the barber shop are trimmed with strips of the alloy and panels are formed on the walls with No. 14 gage strip, 1 1/8-in. and 2 3/16-in. wide. The doors have large panels of satin-finished Allegheny metal combined with brass over plywood, and the fireplace is a combination of high chrome-nickel alloy steel, brass, marble and terra cotta. In the tourist cabins, 3/8-in. polished round bars have been used for towel and other racks. Fabrication of the metal was by the Newport News Shipbuilding & Drydock Co., builder of the vessel.

"Much Faster And Easier To Operate"



Super-Service Radial in the Dansville, N. Y., Plant of the Foster Wheeler Corp. (412—2" holes through 1¾" of forged steel—drilled and reamed to within .002")

All Controls at the Head Eliminates Walking and Climbing on This Job

Centralized Control at the drilling position enables the operator of this SUPER-SERVICE Radial to drill and ream these 2" holes in forged steel headers, without leaving his position at the drill head to change speeds or to unclamp and clamp the column and the arm. Controls for all speeds and feeds, electric column clamp, arm clamp and elevation of the arm, power rapid traverse and every operation of the machine are within easy reach of the drilling position.

Think what time and energy would be wasted if that were not the case. Yet more than half of the radial drills in use today do not have the money saving feature of 100% centralized control. Perhaps there is such a machine in your shop. If so let us help you prove that a new SUPER-SERVICE Radial would reduce your drilling costs 30% or more and pay dividends greater than any other investment your company could make. Is this a logical time to investigate possible savings?

Write for the booklet "Leadership Calls Forth Leadership" and Catalog R-11A. Then you will have the facts concerning SUPER-SERVICE performance and construction.

The SUPER-SERVICE *Radial*

THE CINCINNATI BICKFORD TOOL COMPANY, CINCINNATI, OHIO

ing, 20 x 95 ft.; one-story coke crusher plant, 26 x 27 ft.; and two-story coke storage and distributing unit, 41 x 55 ft., to cost about $60,000 with equipment.

Bay Shore Packing Co., Addison, Me., plans rebuilding of part of food products packing plant, recently destroyed by fire, with loss more than $70,000 including equipment.

Lowell Electric Light Corpn., Lowell, Mass., has awarded general contract to New England Power Construction Co., 89 Broad Street, Boston, for two-story equipment storage and distributing plant, with service and repair departments, to cost about $120,000 with equipment.

More than 400 employees in locomotive shops of Boston & Albany Railroad, West Springfield, Mass., idle for nearly eight weeks, are back at work on a four-day week basis, and it is understood that activities at New York, New Haven & Hartford Railroad, Readville, Mass., and at Boston & Maine Railroad car repair shops will shortly be increased. September will see quite a step-up in operations at most New England metal working plants, but few full time schedules are contemplated this month.

Arrow-Hart & Hegeman Electric Co., Hartford, Conn., has started preliminary work on a one-story addition.

Berst, Forester, Dixfield Co., Peru, Me., is taking bids on a plant and saw mill to cost $30,000 with equipment.

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Cleveland

PLANS are being considered by Pennsylvania Railroad Co., Philadelphia, for new engine house and terminal, with shop and reconditioning units at Girard, Ohio, to cost over $500,000. Present locomotive shops will be removed from New Castle, Pa., and Alliance, Ohio.

Overhead Door Co., Inc., Warren, Ohio, care of W. C. Reeker, 211 Kresge Building, attorney, recently organized by Frank W. Metcalfe, Jr., Warren, and associates, is considering operation of local factory for manufacture of overhead doors and hardware specialties. F. M. Sharp, Warren, is interested in new company.

Brown Fence & Wire Co., 6532 Juniata Avenue, Cleveland, has filed plans for a two-story addition, 66 x 120 ft., to cost about $50,000 with equipment. Christian, Schwartenberg & Gaede Co., 1836 Euclid Avenue, is architect and engineer.

Building Commission of Lorain County, Court House, Elyria, Ohio, F. L. Ellenberger, clerk, is asking bids until Sept. 16 for steel filing equipment, steel office equipment, steel shelving, steel cupboards, etc., for Lorain County Tuberculosis Hospital, Amherst Township.

Board of Works, Van Wert, Ohio, plans installation of electric-operated pumping machinery and other power equipment for a new sewer system and sewage disposal plant to cost $500,000. A bond issue is being arranged.

In connection with consolidation of lines of Wabash Railroad and Nickel Plate Railroad near Toledo, Ohio, plans are under way for establishment of new yards between that city and Maumee, Ohio, consisting of new tracks, shop units, storage and distributing facilities and other structures, to cost $1,500,000. Wabash company has applied to County Commissioners to proceed with work.

General Television & Mfg. Co., Inc., Toledo, Ohio, care of S. D. Miller & Co., Board of Trade Building, attorneys, re-

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MACHINERY EXPORTS SMALLEST IN EIGHT YEARS

WASHINGTON, Sept. 4.—Declining $5,624,000, exports of machinery in July were valued at $22,679,000, against $28,303,000 in June. The July total was the smallest for any month since February, 1923. In the first seven months of 1931, exports, aggregating $219,802,000, showed a drop of $132,148,000 under the like period of last year.

Exports of agricultural machinery in July decreased to $1,864,000 from $2,083,000 in June. Machine tools exports dropped to $1,664,000 from $4,084,000. Exports of oil well machinery rose to $1,430,000 from $842,000. Industrial machinery exports, as classified by the Division of Statistics, Department of Commerce, totaled $11,378,717.

Imports of machinery, as listed in THE IRON AGE tables, rose to $1,129,988 from $905,872 in June.

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Imports of Machinery into the United States

	July		Seven Months Ended July	
	1931	1930	1931	1930
Metal-working machine tools	$21,078	$69,432	$138,251	$690,467
Agricultural machinery and implements	176,104	265,843	2,720,211	7,418,762
Electrical machinery and apparatus	280,418	175,830	1,513,634	1,367,486
Other power-generating machinery	29,041	37,837	191,519	373,306
Other industrial machinery	480,502	809,801	2,861,154	5,600,256
Vehicles, except agricultural	142,845	209,932	1,879,741	1,660,270
Total	$1,129,988	$1,568,675	$9,304,510	$17,110,547

Machinery Exports from the United States
(By Value in Thousands of Dollars)

	July		Seven Months Ended July	
	1931	1930	1931	1930
Locomotives	$49	$102	$147	$538
Other steam engines	13	11	128	121
Boilers	34	120	247	686
Accessories and parts	14	70	252	599
Automobile engines	112	467	1,788	5,022
Other internal combustion engines	254	622	1,002	5,822
Accessories and parts	168	249	1,000	2,253
Electric locomotives	43	54	142	540
Other electric machinery and apparatus	372	936	2,828	6,411
Excavating machinery	516	1,035	2,001	6,969
Concrete mixers	24	33	221	628
Road-making machinery	86	371	912	2,304
Elevators and elevator machinery	195	319	2,386	3,498
Mining and quarrying machinery	737	964	6,871	10,282
Oil-well machinery	1,430	1,646	8,058	17,480
Pumps	388	670	3,120	5,894
Bending and power presses	188	222	2,180	2,822
Forging machines	354	157	2,465	1,345
Machine tools	1,664	2,516	17,286	16,243
Other metal-working machinery and parts	286	491	2,321	4,149
Textile machinery	489	1,227	4,087	12,042
Sewing machines	289	402	2,454	4,672
Shoe machinery	77	116	648	1,046
Flour-mill and grist-mill machinery	14	29	181	2,301
Sugar-mill machinery	185	621	594	2,233
Paper and pulp-mill machinery	100	345	858	1,943
Sawmill machinery	20	40	389	519
Other woodworking machinery	82	151	681	1,080
Refrigerating and ice-making machinery	83	197	716	2,047
Air compressors	270	500	1,685	4,030
Typewriters	626	1,017	6,130	11,079
Power laundry machinery	34	78	534	990
Typesetting machines	172	313	1,641	2,389
Printing presses	247	355	1,513	3,103
Agricultural machinery and implements	1,864	7,403	51,928	86,389
All other machinery and parts	11,200	14,158	90,408	122,481
Total	$22,679	$38,007	$219,802	$351,950

AMERICAN SHEETS

Black—Galvanized—and Keystone Rust Resisting Copper Steel Sheets
U S S Stainless and Heat Resisting Steel Sheets—Tin and Terne Plates for all Purposes

A splendid new hostelry of the middle West

THE NEW Park Plaza Hotel

St. Louis, Missouri

Architects—Laurence O. Schopp and Edwin J. Bauman
General Contractor and Owner—The Koplar Company, St. Louis
Sheet Metal Contractors—D. F. Edwards Heating Company, St. Louis

This fine structure represents a noteworthy achievement in our nation's hotel building. Naturally such an imposing and magnificent edifice required that each particular feature of its construction be of the highest quality material combined with excellent workmanship. In true keeping with these standards, over one hundred tons of

Apollo Best Bloom Galvanized Steel Sheets

were used in the construction of the ventilating system of this hotel.

American Sheet and Tin Plate Company
GENERAL OFFICES: Frick Building, PITTSBURGH, PA.
SUBSIDIARY OF UNITED STATES STEEL CORPORATION

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES:

American Bridge Company
American Sheet and Tin Plate Company
American Steel and Wire Company
Carnegie Steel Company
Columbia Steel Company
Cyclone Fence Company
Federal Shipb'ldg. & Dry Dock Co.
Illinois Steel Company
Minnesota Steel Company
National Tube Company
Oil Well Supply Company
The Lorain Steel Company
Tennessee Coal, Iron & Railroad Co.
Universal Atlas Cement Company

Pacific Coast Distributors—Columbia Steel Company, Russ Building, San Francisco, Calif. *Export Distributors*—United States Steel Products Company, 30 Church Street, New York, N. Y.

cently organized by I. H. Fellman, H. P. Miller and associates, plans operation of local factory for manufacture of television and radio equipment.

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Buffalo

BUILDING at 329 Temple Street, Syracuse, N. Y., has been leased by Rudley Mfg. Co., formerly of Boston, for new plant for manufacture of coil springs, box springs and kindred products. Boston factory will be removed to new location, where production will be concentrated. Headquarters, also, will be maintained at Syracuse.

Mohawk Paper Mills, Inc., Waterford, N. Y., has been formed with capital of $50,000 and 500 shares of stock, no par value, to take over mills of Mohawk Paper Makers, Inc., at Waterford and Cohoes, N. Y. New company will be headed by Louis R. Breslin, Cohoes, formerly vice-president of Waterford Knitting Co., Waterford, who recently purchased Mohawk plants from receiver. Operations will begin at once, with plans for improvements. Daniel F. Halpin and George F. Morrison, both of Waterford, are interested in new company.

Lycoming Natural Gas Co., Wayne, N. Y., a subsidiary of Standard Oil Co. of New Jersey, 26 Broadway, New York, has acquired controlling interest in Pentoga Gas Co., Elmira, N. Y., and Degolier & Wyss, Wayne, both operating natural gas properties in Wayne field, and will develop holdings for increased supply. Lycoming company is arranging with Niagara Hudson Power Corpn., Buffalo, for marketing of natural gas in its territory, to include construction of pipe lines, distributing mains, compressor stations and other operating facilities.

David Levitt, 146 Joseph Avenue, Rochester, N. Y., and associates have organized Levitt Mfg. Corpn., and plan operation of local factory for manufacture of metal goods and tool specialties.

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Cincinnati

BIDS have been asked on general contract by Stevenson Brothers Machinery Co., Lockland, Ohio, manuacturer of machinery and parts, for one-story machine shop, 35 x 85 ft., to cost about $30,000 with equipment. Grunkemeyer & Sullivan, 3717 Eastern Avenue, Cincinnati, are architects.

City Council, Lima, Ohio, Fred C. Becker, City Hall, city manager, is considering a municipal electric power plant for service at city pumping plant, sewage disposal works and other city-owned buildings, to cost over $75,000.

Contracting Officer, Wright Field, Dayton, Ohio, is asking bids until Sept. 14 for two bench lathes, two benches with motor drives and one set collets; until Sept. 16 for 14 truck engine parts; until Sept. 21 for 916,000 ft. cable, 100 shaft assembies, 100 fuel pump drive assemblies, 100 fuel pump drive coupling assemblies, and 500 stream-line tie rods.

State Board of Education, Nashville, Tenn., is arranging early call for bids for three-story and basement industrial art school, to cost $125,000 with equipment. Marr & Holman, Stahlman Building, are architects.

Board of Education, Springfield, Ohio, plans installation of manual training equipment in new multi-story junior high school to cost over $300,000, for which low bid on general contract has been received from J. W. Nadalin & Co., 38 South Sixth Street, Columbus, Ohio, at $212,900. Eastman & Budke, Columbian Building, Springfield, are architects.

Public Utilities Development Co., Louisville, and local operating interest, Kentucky Electric Development Co., Breslin Building, are considering hydroelectric generating plant on Chaplin River, near Bardstown, Ky., to include power dam, 50 ft. high and 700 ft. long; artificial lake 20 miles long, generating station, high-tension transmission lines, etc., to cost over $3,500,000.

Smith Brothers Hardware Co., 580 North Fourth Street, Columbus, Ohio, manufacturer of hardware and other specialties, is considering a six-story factory addition, 50 x 100 ft., part of unit to be used for storage and distribution, to cost over $125,000 with equipment.

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Pittsburgh

BIDS have been asked by Norton Co., Worcester, Mass., manufacturer of grinding machinery, abrasive products, etc., for a three-story factory branch, storage and distributing plant, 100 x 144 ft., at Pittsburgh, to cost over $75,000 with equipment.

Following recent lease of plant of Standard Plate Glass Co., Butler, Pa., from receivers by George C. Stewart, Butler, and associates, Standard Plate Glass Corpn., has been organized to take over certain assets of former company and operate plant. Factory has been closed for two years and will be remodeled by new organization, including machinery reconditioning and replacements. Works will be given over to sheet glass production. New corporation has secured option to purchase plant later.

National Transit Co., Oil City, Pa., affiliated with National Transit Pump & Machine Co., same place, has approved plans for modernization of pipe line from Point Breeze, near Philadelphia, to Franklin, Pittsburgh and vicinity, including installation of new pumping plants and other power equipment.

Molded Rubber Products Corpn., Derry, Pa., has been organized by J. Fred Kuntz, Derry, and associates, with capital of $15,000 and 150 shares of stock, no par value, and plans operation of factory for production of line of rubber goods. C. D. Byers and H. F. Kimmel, both of Derry, are interested in company.

Department of Public Safety, City-County Building, Pittsburgh, James M. Clark, director, is asking bids until Sept. 14 for furnishing and installing about 10,000 metal roadway markers.

Acting as trustee for bondholders of Pittsburgh Malleable Iron Co., 3449 Charlotte Street, Pittsburgh, with properties in Allegheny County, Bank of Pittsburgh, N. A., has brought action for permission to sell plant and property of company.

St. Louis

PLANS are under way by Kansas City Power & Light Co., Fourteenth Street and Grand Avenue, Kansas City, Mo., for one-story power substation and distributing plant, to cost over $50,000 with equipment. H. G. Freshman is company architect, address noted.

J. I. Case Co., Inc., Racine, Wis., manufacturer of agricultural implements, etc., has awarded general contract to Ellis, Nicholson & Cramer, Inc., Security Building, Oklahoma City, Okla., for one-story addition to factory branch, storage and distributing plant at Oklahoma City, 40 x 100 ft., to cost close to $30,000 with equipment.

Sinclair-Texas Pipe Line Co., Tulsa, Okla., an interest of Sinclair Refining Co., 45 Nassau Street, New York, has authorized erection of an electric-operated oil pumping plant on tract recently acquired near Turlington, Okla., to cost over $50,000 with machinery.

Missouri Electric Co., Dubuque, Iowa, has applied for permission to State Public Service Commission, Jefferson City, Mo., for erection of a power dam across Niangua River, Camdem County, Mo., for hydroelectric power service, to cost over $600,000.

Board of Public Works, Oklahoma City, Okla., is planning extensions and improvements in municipal waterworks to cost over $2,500,000, of which about $600,000 will be used for pipe lines and more than $300,000 for tank and storage equipment. Pumping machinery and other power equipment will be installed. L. M. Bush is city engineer.

Missouri Public Service Co., Pleasant Hill, Mo., is arranging for purchase of electric light and power properties of Ozark Utilities Co., Bolivar, Mo., operating in southwestern part of State, and will consolidate. Purchasing company plans expansion and improvements, including transmission lines.

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Detroit

WORK is under way by Gar Wood Engineering Co., Bellevue and Canfield Avenues, Detroit, manufacturer of boilers, oil-burning equipment and devices, on removal of plant to 409 Connecticut Avenue, where about three times former floor space will be provided.

Mechanical Handling Systems, Inc., 3454 Denton Avenue, Detroit, manufacturer of mechanical conveyors, parts, and other mechanical-handling equipment, has broken ground for new one-story plant, 60 x 260 ft., with lean-to extension, 40 x 260 ft., for which general contract recently was let to Austin Co. It will cost about $100,000 with equipment. Company will remove works to new location with installation of additional machinery.

Copper District Power Co., Calumet, Mich., an interest of Copper Range Mining Co., same address, is securing water rights on Lake Gogebic and plans a hydroelectric power development, including power dam, generating station and transmission lines, to cost more than $500,000 including water rights. Company also proposes to build other power-

LEEDS & NORTHRUP COMPANY PRESENTS

MICROMAX

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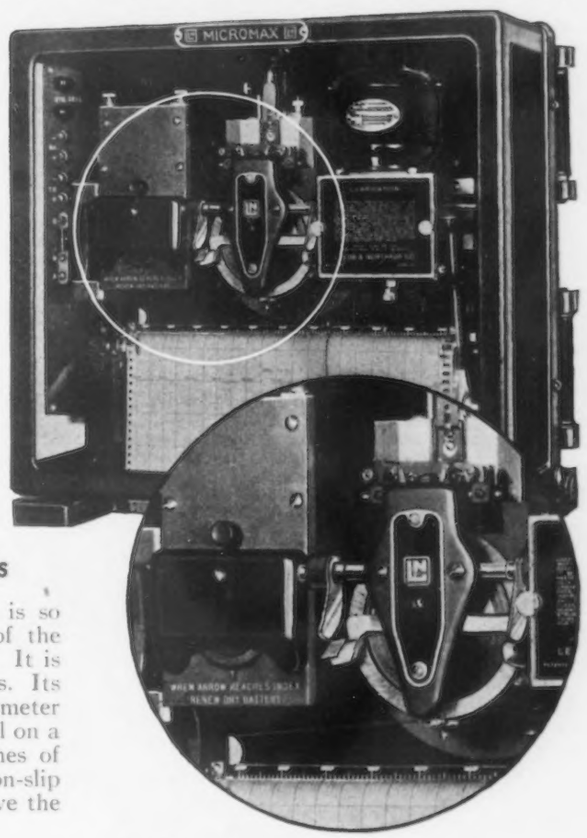
MICROMETER SENSITIVITY, SELF-STANDARDIZATION AND HIGH-SPEED RECORDING

NOW comes the fully automatic potentiometer—Micromax—the improved L & N Potentiometer Pyrometer, embodying basic improvements, raising the potentiometer pyrometer to a new high level of accuracy, of reliability and of strictly automatic operation.

Like the announcement made over twenty years ago, when Leeds & Northrup introduced the first industrial potentiometer pyrometer, today's announcement brings pyrometer users *basic* new advantages—a new order of sensitivity, speed, accuracy and reliability.



No Daily Attention—No Adjustments

The new Micromax "scissor-action" balancing device is so microscopically sensitive that it will detect deflections of the galvanometer pointer amounting to 1/1000th of an inch. It is practically unaffected by wear. It requires no adjustments. Its recording action is responsive and speedy as no potentiometer recorder has ever been—so fast that the pen or print-wheel on a Micromax Recorder will step across the entire 9⅞ inches of calibrated chart in less than twenty-two seconds. Its non-slip clutch is automatically prevented from attempting to move the mechanism beyond either end of the scale.

Micromax is the fully automatic industrial potentiometer pyrometer. It needs no daily attention; the instrument circuit in every model is standardized automatically, every forty-five minutes or less, more accurately than can be done manually.

To industry in general, and in particular to the many thousands of present users of L & N Potentiometer Pyrometers, Micromax is presented as the culmination of over twenty years of specialization in industrial potentiometer pyrometers and of three years of concentrated work in the final development of its particular refinements.

See MICROMAX and also the New General-Purpose HO-HUMP Furnace at the Metal Show in Boston, September 21-25

The Super-Sensitive, "Scissor-Action" Balancing Device

Requiring no adjustment and not affected by wear, the Micromax "scissor-action" balancing unit responds to galvanometer pointer deflections as small as 1/1000th of an inch.

Variables due to daily manual standardizing of the instrument circuit are also eliminated in Micromax. Every forty-five minutes or less the circuit is standardized automatically—more accurately than is done manually. The mechanism itself automatically safeguards this vitally important phase of potentiometer operation.

To Present Users of L & N Potentiometer Pyrometers

In accord with our established policy, protection is given to the thousands of present users of L & N Potentiometer Pyrometers in that the Micromax "scissor-action" balancing device and the automatic standardizer are unit assemblies which can be installed in present L & N recorders in the user's own plant, with little or no interruption to service.

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OF NEW CATALOG O-87

A NEW STANDARD OF ACCURACY AND DEPENDABILITY IN INDUSTRIAL PYROMETERS

P-247

dams for hydroelectric power service, entire development to cost more than $10,000,000.

E. M. Buchanan, Charlotte, Mich., has acquired former local plant of Goodrich Mfg. Co. for a new machine works for general machine and parts production.

Dow Chemical Co., Midland Mich., plans erection of a new unit for producing new magnesium metal alloy, with departments for rolling, fabricating and other service. A heat-treating division will be installed. Unit will cost more than $250,000 with machinery.

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Chicago

CONTRACT has been let by Jefferson Electric Co., Fifteenth and Laflin Streets, Chicago, manufacturer of electric transformers, switches, etc., to Austin Co., for one and two-story plant, 325 x 650 ft., at Bellwood, Ill., to cost about $550,000 with machinery. Company will remove to new location and carry out large increase in output.

Chicago, Burlington & Quincy Railroad Co., Aurora, Ill., is considering rebuilding part of local construction and repair shops destroyed by fire Sept. 2, with loss more than $350,000 including equipment. General offices are at 547 West Jackson Boulevard, Chicago.

Ben B. Moore, Village Recorder, Edina, Minn., with offices at 4605 Wooddale Avenue, Minneapolis, is asking bids until Sept. 15 for two motor-driven pumping units, with accessories, connections, etc., for waterworks. Albert Graber, Phoenix Building, Minneapolis, is consulting engineer.

Rose Aeroplane & Motor Co., 7209 Lawrence Avenue, Chicago, recently organized by J. W. Rose, Earl Howe and associates, with capital of $100,000 and 10,000 shares of stock, no par value, plans operation of local factory for manufacture of aircraft motors and parts.

Petroleum Products Co., 2600 West Larpenteur Avenue, St. Paul, Minn., has rejected bids recently received for a new two-story and basement oil storage and distributing plant, 60 x 75 ft., to cost over $45,000 with equipment, and will ask new bids on general contract later. Buechner & Orth, Shubert Building, are architects.

City Council, Kenyon, Minn., is considering erection of a municipal eelctric light and power plant, to cost close to $100,000 with machinery. A. S. Kindseth is city clerk.

Armour & Co., Chicago, have plans for installation of additional power equipment at meat-packing plant at Fargo, N. D., including boiler unit, stoker and accessory equipment.

Abart Gear Machine Co. Cicero, Ill., has changed its name to Abart Gear & Machine Co.

Anderson Foundry Co., 1725 West Carroll Avenue, Chicago, has been incorporated with capital of $20,000, to manufacture castings and operate a general foundry. Mortimer Porges, City Hall Square Building, Chicago, is correspondent.

Gulf States

BIDS will be received by United States Engineers' Office, Vicksburg, Miss., until Sept. 15 for three clamshell dredging buckets, each with capacity of ¾-cu. yd., also for quantity of galvanized steel roofing, roofing nails, etc.

American Fertilizer & Chemical Works, San Saba, Tex., Thomas F. Hawkins, president, has acquired structure at San Antonio, Tex., for new plant, including mixing, pulverizing, conveying, weighing and other equipment, to cost close to $50,000 with machinery. Company also proposes to develop deposits of green sand marl in Bexar County for raw material supply.

Armbruster Machine Shop, Fourteenth Street, Temple, Tex., plans rebuilding part of plant recently destroyed by fire.

Darco Corpn., Marshall, Tex., will carry out expansion and improvements at lignite properties, including installation of additional equipment to replace certain present machinery. Entire project will cost more than $50,000. Headquarters are in Delaware Trust Building, Wilmington, Del.

Riveria Utilities Co., Foley, Ala., has purchased Silver Hill Power Co., operating at Silver Hill, Ala., and vicinity and is planning expansion and improvements in that district, including transmission line from Robertsdale, Ala., to Silver Hill.

Mississippi Sand & Gravel Co., recently organized by D. B. Hill, 115 North Spring Street, Little Rock, Ark., and associates, with capital of $100,000, has purchased interest in properties of Kolola Gravel Co., Columbus, Miss., comprising over 100 acres of sand and gravel lands. It is planned to install mining machinery, conveying, loading and other equipment, to cost over $60,000.

United Gas Public Service Corpn., Monroe, La., operated by United Gas Co., 1601 Commerce Street, Houston, Tex., has authorized erection of a new gas compressor station for pipe line service near Alto, Richmond Parish, La., with main one-story unit, 50 x 125 ft., to cost over $250,000 with equipment. Company will use part of equipment now at a station at Waskom, Tex., in addition to new machinery.

Lake Wales Citrus Growers' Association, Lake Wales, Fla., plans installation of mechanical packing, conveying, loading and other equipment in new one-story packing plant, 200 x 300 ft., for which contract has been let to G. A. Miller, 312 Twiggs Street, Tampa, Fla., to cost over $135,000 with machinery. J. M. Tillman is president of association. P. F. Kennard, 303 Jack Street, Tampa, is architect.

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Indiana

BOARD of Education, East Chicago, contemplates installation of manual training equipment in new three-story and basement high and grade school, 80 x 220 ft., to cost about $350,000, for which plans are being drawn by Karl Norris, Calumet Building, architect.

City Council, Huntingburg, has asked bids on general contract for a municipal electric light and power plant, to cost close to $50,000 with equipment. Charles Brossman, Chamber of Commerce Building, Indianapolis, is consulting engineer.

Richard H. Garver, Union City, and associates have organized Garver Machine Corpn. and plan operation of local factory for machine work and manufacture of electrical and mechanical equipment. Edgar Miller, Union City, is interested in new company.

Indiana Electric Corpn., Indianapolis, operating electric light and power properties, is arranging for a note issue of $2,500,000, part of fund to be used for extensions and improvements in plants and system.

Board of Public Works, Michigan City, has awarded general contract to Tonn & Blank, 104 North Franklin Street, for a one-story and basement municipal automobile service, repair and garage building. Samuel Bonstra, Warren Building, is architect.

Officials of Bendix Corpn., South Bend, manufacturer of automobile and aircraft equipment, instruments and precision equipment, etc., have organized Bendix Products Corp'n, a subsidiary, to manufacture aircraft and marine equipment. Incorporators include John R. Whitman and Horace G. Marshall.

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Pacific Coast

PLANS have been approved by Union Ice Co., 354 Pine Street, San Francisco, for one-story ice-manufacturing plant at Redwood City, 100 x 126 ft., to cost over $50,000 with machinery.

Loose-Wiles Biscuit Co., Commerce Building, Kansas City Mo., has plans for initial unit of new baking, storage and distributing plant, 80 x 260 ft., on site recently acquired at Los Angeles, to cost over $175,000 with equipment. Later company will build main five-story unit, 150 x 260 ft., at same location, also other buildings, with ultimate cost of about $1,000,000. Traveling ovens, power equipment, conveying and other machinery will be installed.

Angelus Sanitary Can Machine Co., 1900 Pacific Boulevard, Los Angeles, has awarded general contract to Austin Co. of California for a one-story addition, 60 x 90 ft., to cost about $24,000 with equipment.

Quartermaster Department, Alameda, Cal., has plans for new Government air depot at local field, consisting of a main hangar, 200 x 440 ft., with repair and reconditioning facilities; depot and supply building, 334 x 480 ft.; administration building, 100 x 180 ft.; power house, utility, repair and garage building, pumping plant, fuel oil storage tank department, radio station and other units. An appropriation of $743,000 has been made by Congress for depot, with ultimate cost more than $2,000,000 including equipment. Capt. Leander Larson is construction quartermaster in charge.

National Steel Construction Co., 425 Frontenac Street, Seattle, has awarded general contract to H. D. Stewart, Smith Tower Annex, for two new units 60 x 150 ft., and 40 x 90 ft., respectively, to replace part of plant recently destroyed by fire. Last noted building will be used as a steel galvanizing plant.

Columbia River Power Co., Portland, has applied for permission to build a hydroelectric generating plant on Columbia River, near Stevenson, Wash. Power station will be 100 x 600 ft., with initial installation of four 30,000-hp. generator units, later to be increased to six. A

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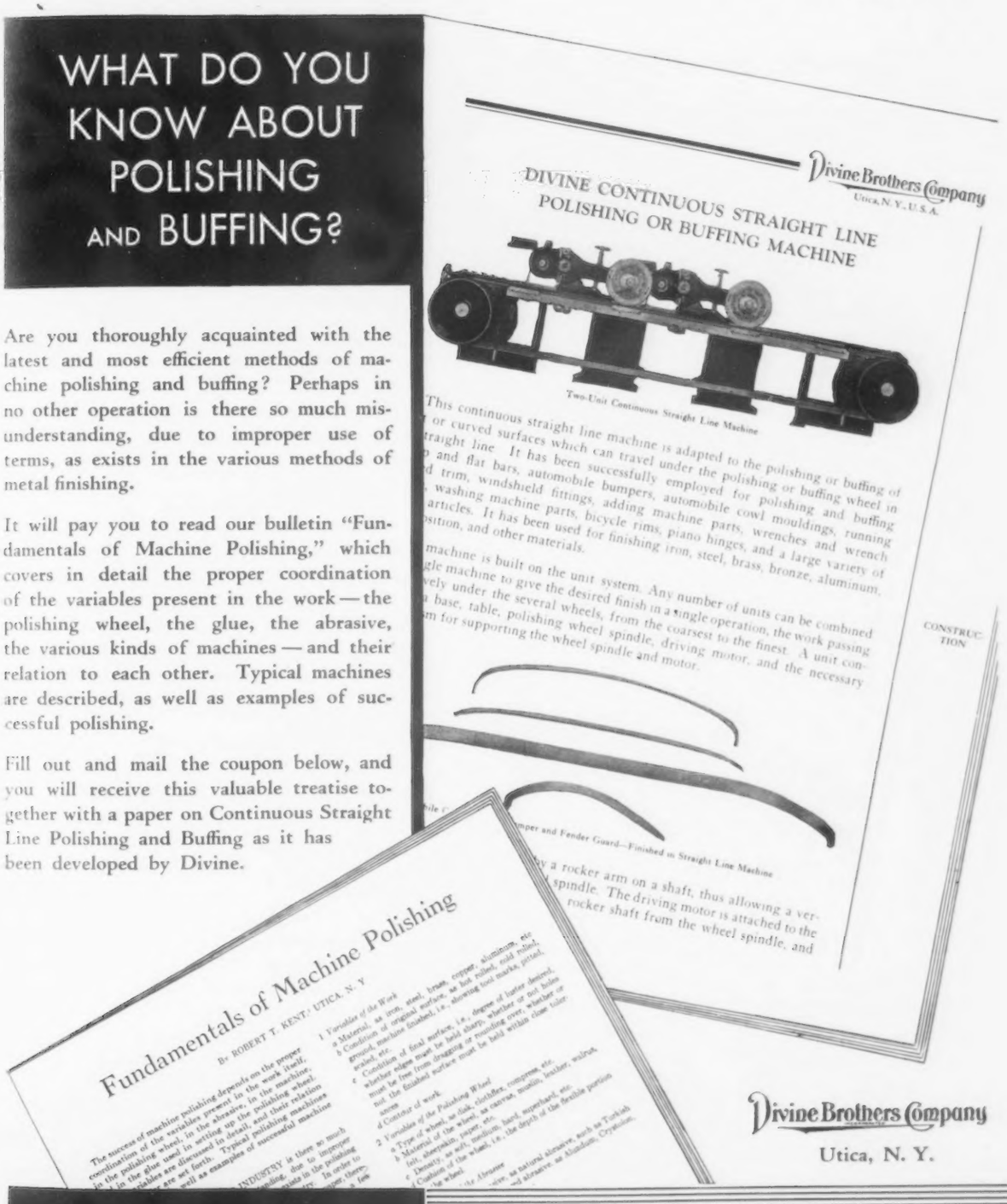

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Business as Others See It

Digest of Current Financial and Economic Opinion

ONLY two of the economic reviews scanned this week speak hopefully. *Commerce and Finance* and Silberling see the silver lining. The latter finds the outlook "distinctly brighter, but this is looking ahead over an extended period and the view does not necessarily inspire hope in the *immediate* or instantaneous revival of domestic trade."

Theodore H. Price, in the former, suggests that "the coming winter may disappoint the pessimists by a business revival which will equal that which commenced in 1921. . . . Few expected the boom which commenced in 1921 or the collapse which began in 1928, and it is quite possible that the lugubrious prophecies of hard times during the coming winter will not be realized. . . . Prevailing sentiment is too bearish."

He tells us that "the public is commencing to heed the advice offered it, by moderate purchases of the staple commodities." And he sounds a warning against "the constant tinkering with the law of supply and demand which is being attempted in Washington."

National City Bank, New York, testifies to the buying movement: "While the immediate wants of the people are furnishing a steady flow of business in articles of common every-day necessity, the feeling of uncertainty which still pervades the business world has continued to have a restraining influence upon the longer-term constructive undertakings from which the heavier industries derive their principal support."

Harvard Economic Society finds declines in August more than seasonal, seasonal increases absent or deficient and "few significant evidences of the customary seasonal expansion in business activity;" and concludes that "business conditions in the United States will be largely subject to the influence of European developments which it is impossible to forecast."

Walter Lippmann, bowing from his new column in *Herald Tribune*, New York, takes us severely to task for past misdeeds and misconceptions. "We have clung with passionate faith," he says, "to the idea that a boom and a crash and a recovery follow each other, like winter and summer, in a fixed cycle. This belief in the automatic restoration of prosperity has made us, for the time being, a nation of fatalists." But . . . "the prelude to any recovery is to liquidate and cancel the accumulated miscalculations of the preceding boom. Therefore the one sure way to prolong a depression is to resist it by trying to stand pat," is his dictum.

Hope of early improvement in business activity is fading, according to Alexander Hamilton Institute and *Annalist*. The latter warns against any tax revision, for unemployment relief or otherwise, because of "the inevitable uncertainty and disturbance to business which would be involved." "Present taxes," it says, "provide revenues which are entirely adequate, on the average, over a period of good and lean years."

That paper calls attention anew to the futility of leaning upon public construction for relief from unemployment. Nevertheless, a time of depression is "the proper time to release all the work of this nature which can be released." But the reason is, merely, low construction costs.

Prospects of another "bonus raid" on the Treasury move *Financial Chronicle* to conclude that this "would leave early revival of trade absolutely hopeless." With a deficit of 903 millions just past, and prospects of a further deficit which may reach 1500 millions this year, that "would be the last straw."

Production has been below consumption for a year or so, according to Brookmire. But we have been moving to a lower average standard of living, it is said.

steel tower transmission line will be built. Project will include tunnels and pipe lines for water supply and will cost more than $10,000,000.

City Commission, Phoenix, Ariz., has awarded general contract to Surety Building Corpn., Roosevelt and Grand Avenues, for municipal sewage disposal plant, including four main operating units, with power plant, switchboard room, pumping station and other structures, to cost about $500,000 with machinery.

Foreign

UNDER direction of Ministries of War and Industry, Shanghai, China, Kaicheng Acid Mfg. Works, Ltd., has been organized and will proceed with erection of new plant near Shanghai for production of sulphuric acid. Initial works will cost over $150,000 with machinery. Later it is proposed to increase facilities for manufacture of nitric acid, sulphate of chloride and kindred products.

Tropical Radio Telegraph Co., South Hingham, Boston, has closed agreement with Government of Bahama Islands, W.I., for a radio broadcasting and receiving station at Nassau, to cost $80,000, with power station and other operating equipment, towers, etc.

Ministry of Public Works, Rome, Italy, is arranging a fund of $45,000,000 for expansion and improvements during winter, including development of hydroelectric power projects, transmission lines, reclamation of Pointine marshes, between Rome and Naples, with installation of pumping machinery and other power equipment. Ministry of Communications is planning total fund of $100,000,000 for new construction and improvements, including railroad lines and equipment, additional shop facilities and other work.

In connection with plan for electrification of several railroad lines in England, Minister of Transport, London, is arranging for Diesel-electric equipment installation, instead of line electrification, to include oil-operated power generators in motor cars and accessories. Entire project will be carried out over period of years and will cost close to £150,000,000 ($729,000,000), covering both main lines and branches.

Milwaukee

EIGHT acres along Sheboygan River have been acquired by C. Reiss Coal Co., Sheboygan, Wis., as site of an additional coal dock costing about $1,500,000. It is planned to begin preliminary work before end of year.

Wadhams Oil Co., 901 South First Street, Milwaukee, has plans for new steel drum reconditioning shop, 35 x 100 ft., and an addition to compounding house, 34 x 100 ft., at main local plant. Investment in buildings and equipment will be about $60,000.

Henry Peterson, formerly of Marinette, Wis., and engaged in tool and die business for 20 years, has leased space in plant of Welded Products Co., in Cudahy, and will operate under name of Peterson Tool & Die Co. Present equipment consists of four lathes, seven drill presses, three milling machines, two planers, five shapers, five grinders, a boring bar and other units.

Loocher-Schefrin Co., 1120 South Barclay Street, Milwaukee, sustained loss by fire in its smelting furnace shop on Sept. 1. Equipment consisted of three gas-fired furnaces. Plans are to rebuild immediately.

Wisconsin Sheet Metal Works, Milwaukee, has been organized by Conrad Frank and Stanley Gelhaar and is opening for business at 1545 North Twenty-seventh Street.

Edwin G. Beardmore, secretary, Board of Vocational Education, Oshkosh, Wis., is taking bids until Sept. 22 for a junior high school addition to Merrill school, to cost $210,000.

Cereal Products Co., 605 Washington Street, Manitowoc, Wis., has placed general contract with McKenzie-Hague Co., 422 Corn Exchange Building, Minneapolis, for a 500,000-bu. grain elevator, 125 ft. high.